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A STUDY OF THE IOWA TESTS OF EDUCATIONAL  
DEVELOPMENT AND THE SRA PRIMARY MENTAL  
ABILITIES USED IN THE MONTANA STATE  
WIDE COOPERATIVE TESTING PROGRAM

by

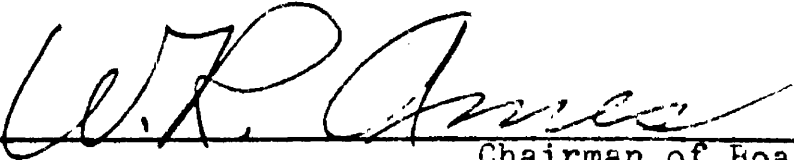
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B.A., Montana State University, 1949

Presented in partial fulfillment of the  
requirement for the degree of Mas-  
ter of Arts.

Montana State University

1951

Approved:

  
Chairman of Board  
of Examiners

  
Dean, Graduate School



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## CHAPTER I

### INTRODUCTION

The transfer of the interests and efforts of teachers and administrators from subject matter to the student is one of the most important changes currently taking place in American schools. It is a change from the formal teaching of groups to the guidance of individual boys and girls. This trend in educational philosophy and practice had its beginnings about the time of the first World War, it gathered impetus during the 1920's, and it expanded notably during the 1930's and early 1940's.<sup>1</sup>

During this time many Montana educators, recognizing the trend in education, established guidance programs in their schools. Some of the guidance programs were quite noteworthy and consisted of a wholehearted attempt to help boys and girls become well adjusted students and citizens. On the other hand, some schools had guidance programs which merely consisted of giving tests and then filing them away in a safe to collect dust. Then there were also some schools which made no organized attempt to guide and counsel students.

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<sup>1</sup>A. E. Traxler, "Evaluation of Aptitude and Achievement in a Guidance Program," Educational and Psychological Measurements, 6:3-16, No. 1, 1946.

Some Montana educators, recognizing the inequalities of guidance activities performed by the individual schools and recognizing the great need for guidance, formed the State Committee on a Coordinated Testing Program for Guidance in Montana and from this organization the Montana State Wide Cooperative Testing Program was established in 1947. Since its origin, it has distributed over 29,385 test batteries throughout the state at an estimated cost of over \$6,375.00 for the batteries alone.<sup>2</sup> To date the Advisory Committee on Guidance and Testing has released three annual reports on the results of the State Wide Cooperative Testing Program. However, the reports of the program have not yet been analyzed, nor conclusions drawn as to the value and effectiveness of the program in guiding and counseling individual students throughout the schools of the state.

#### PURPOSES

The purposes of this study are threefold: (1) to show the relative value of the Iowa Tests of Educational Development and the SRA Primary Mental Abilities in the Montana State Wide Cooperative Testing Program; (2) to summarize the

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<sup>2</sup>Truman Cheney, Supervisor of Occupational Information and Guidance, Bulletin O.I.G.B.-19, (Montana State Department Public Instruction, Div. Vocational Education, Div. Occupational Information and Guidance), August 15, 1950.

results of the cooperative testing done on a statewide basis for these two tests since the inception of the program in 1947 and to show their implications in a guidance program; and (3) to provide information which may aid in evaluating the effectiveness of the instructional program in the high schools of Montana as a whole.

#### LIMITATIONS OF THE STUDY

This paper is limited to a study of the Iowa Tests of Educational Development (IED) which is a battery of achievement tests, and the S R A Primary Mental Abilities (PMA) which is an intelligence test measuring five of the basic intellectual abilities, both of which are used by the high schools in the state wide testing program. Because of the time factor, the decision was made to limit this study to a comprehensive analysis of these two tests. The IED tests were selected, because very few reports have been made of this test. No intercorrelations had been made of the IED tests except by the publisher. The author felt that intercorrelations of the IED are necessary for knowing whether the various tests in the battery measure different things as they purport to, or whether they measure relatively the same things. The PMA tests were chosen because more tests were available for analysis thus making correlations between the IED and the PMA possible, whereas it was found that not enough

tests of the Kuder Preference Record, the other test used by the high schools, were available for a comprehensive analysis for a correlational study.

#### IMPORTANCE OF THE STUDY

Since the inception of the Cooperative State Wide Testing Program in 1947, no study has been made as to the relative merits of the tests used in the program; nor have analyses been made or conclusions drawn from the test results reported in the first three annual reports that have been released by the Advisory Committee on Guidance and Testing. This study will be concerned with relationship between achievement in various fields to five primary mental abilities as measured by the PMA tests. This should be of value to counselors, because a knowledge of the relationship between achievement and intelligence is very important if effective guidance is to be accomplished. This thesis will also consider the value of the two tests studied. Information will also be provided which may enable educators to evaluate the effectiveness of the instructional program of the high schools throughout the state as a whole.

## CHAPTER II

### BACKGROUND OF THE STATE WIDE TESTING PROGRAM

In order to properly evaluate the effectiveness of the Montana State Wide Cooperative Testing Program and to understand its value in guidance and counseling youngsters throughout the state, it is necessary to know something about the background of the program. In this chapter the development, growth, and present status of the program will be briefly traced and the philosophy and purposes of the program will be presented.

### HISTORY OF THE STATE WIDE TESTING PROGRAM

The Montana State Wide Cooperative Testing Program was conceived at the Bozeman Conference on November 4, 1943, when Mr. Leo Smith, Supervisor of Distributive Education, called the State Advisory Committee on Guidance together for the first time.<sup>1</sup> The committee consisted of twenty-one members made up of representatives from the Montana Association of School Administrators, representatives from five of the six units of the University of Montana, the School of Mines at Butte was not represented, a representative of the United States

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<sup>1</sup>Leo Smith, Supervisor of Distributive Education, Bulletin by State Department of Public Instruction, Div. Vocational Education, Div. Distributive Education, May, 1943.

Employment Service, and several members of the State Department of Public Instruction.<sup>2</sup> At the conference the Advisory Committee unanimously agreed that there should be a state wide minimum guidance program. The following points were discussed and adopted:<sup>3</sup>

1. There should be a specific training program at the institutions of higher learning so that there will be an adequate number of qualified counselors to direct guidance programs within the schools.

2. The program of guidance should be concerned about supplying individuals with cumulative inventories of their abilities, aptitudes, interests, and achievements.

3. Information should be distributed about occupations, college entrance requirements and other life situations.

4. Assembling all available information about each

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<sup>2</sup>The members of the committee were: Dr. W. R. Ames, Prof. Educ., M.S.U.; Dr. James A. McCain, Pres., M.S.U.; C. B. Bartholomew, Missoula County High School; L. C. Brockman, Lewistown; Linus Carleton, Helena, Dr. Sheldon Davis, Pres., W.M.C.E., Dillon; R. A. Gerber, Sidney; L. M. Hepner, Dept. Educ. and Psych., M.S.C.; Mrs. Edith Harwood, State Supervisor of Home Ec.; H. L. Irle, Glasgow; A. O. Jahr, Great Falls; Art Johnson, State Supervisor of Agriculture; L. W. Johnson, Butte; Ralph Kenck, State Director of Voc. Educ.; Robert Downs, U. S. Employment Service; C. G. Manning, Lewistown; Mr. Peterson, E.M.C.E., Billings; J. G. Ragsdale, Billings; John Shively, Bozeman; Dr. G. H. VandeBogart, Pres., N.M.C., Havre; and A. O. Gullidge, State High School Supervisor.

<sup>3</sup>Leo Smith, Supervisor of Distributive Education, Bulletin by State Dept. Public Instruction, Div. Vocational Education, Div. Occ. Inf. and Guidance, November 1943.

individual, and counseling him so that he can make intelligent decisions regarding his future.

In April of 1944, the State Committee on Guidance meeting in Helena expanded the minimum guidance plan adopted at the Bozeman Conference. The committee recommended that some of the following tests from each group be used in the testing program:<sup>4</sup>

- A. Intelligence Tests.
  1. Terman-McNemar Test of Mental Ability
  2. California Test of Mental Maturity
  3. Otis Quick Scoring Mental Ability Test
  4. The Kuhlman-Anderson Tests.
- B. Achievement Tests
  1. New Stanford Achievement Battery
  2. The Myers-Ruch High School Progress Test
  3. Sones-Harry High School Achievement Test
  4. Iowa High School Content Examination
- C. Interest Inventories
  1. G. U. Cleeton, McKnight and McKnight
  2. Kuder Preference Record
  3. Vocational Interest Blank for Men and Vocational Interest Blank for Women by E. K. Strong, Jr.
- D. Personality of Adjustment
  1. California Test of Personality
  2. Washburn Social Adjustment Inventory
  3. Bell Adjustment Inventory
- E. Mechanical Aptitude Tests
  1. Mechanical Comprehension Test--G. K. Bennett
  2. Revised Minnesota Paper From Board Test
  3. Purdue Peg Board
  4. Minnesota Spatial Relations Tests
  5. Minnesota Rate of Manipulation Test

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<sup>4</sup>Smith, Sup. Distributive Education bulletin by State Dept. of Public Instruction, Div. Vocational Educ., Div. Distributive Educ., April 21, 1944.

F. Clerical Aptitude Tests

1. Minnesota Vocational Test for Clerical Workers
2. The O'Rourke Clerical Aptitude Test, Junior Grade (Reasoning)
3. The O'Rourke Clerical Aptitude Test, Junior Grade (Clerical Problems)

This meeting of the Advisory Committee made some of the ideas brought out at the Bozeman Conference more concrete by suggesting definite tests that would be of value in counseling and guidance work. If used, the tests recommended would greatly aid the teacher or counselor by increasing his knowledge about the students, thus enabling him to make helpful suggestions in regard to his future. However, the other major points discussed at Bozeman were not dealt with at Helena. It was felt that more information about the present guidance programs carried on by the individual schools within the state was needed before a definite program could be worked out that would be satisfactory, and above all, a program that would be beneficial to the students concerned.

In October 1945, the State Advisory Committee on Guidance met and decided that it would undertake, in cooperation with the State Department of Public Instruction, a state wide survey of guidance principles and practices in Montana high schools. The study was to continue over a period of three years. The purpose of this study was to find out the status of guidance services in Montana high schools and to stimulate greater efforts to improve guidance services in our



schools.<sup>5</sup>

On December 21, 1946, the Montana Branch of the National Vocational Guidance Association meeting in Helena asked the Montana Association of School Administrators, then in session, to investigate the possibility of establishing a state wide testing program in Montana. Mr. Earl Fellbaum, President of that association, appointed a committee to study the matter.<sup>6</sup> No further action was taken until June when the Montana Educational Problems Conference met at Montana State University at Missoula. The following recommendations were made at the Guidance and Personnel Section of that meeting:

1. That a Policy (now called Advisory) Committee be established which would represent the School Administrators, the State Department of Public Instruction, the Units of the University of Montana, and the classroom teachers.
2. That a Lay Committee be established.
3. That a Technical Advisory Committee of experts in the field of psychiatry, test reading, etc. be established.
4. That there be a paid coordinator to serve the steering committee in executive policy.<sup>7</sup>

As a result of the recommendations made by the Guidance and Personnel Section of this conference, Miss Ireland,

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<sup>5</sup>Smith, Sup. Dist. Educ., Bulletin by Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Dist. Educ., June, 1946.

<sup>6</sup>Truman Cheney, Supervisor of Occupational Information and Guidance, Bulletin O.I.G.B.-19 (Montana State Dept. Public Instruction, Div. Vocational Educ., Div. Occupational Information and Guidance), October, 1947, p. 1.

<sup>7</sup>Loc. cit.

State Superintendent of Public Instruction, appointed representatives of the State Department of Public Instruction and classroom teachers; Dr. Selke, Chancellor of the University of Montana, appointed representatives of the six units of the University; and the Administrators' Committee agreed to represent their group.<sup>8</sup> The group decided that the State Supervisor of Occupational Information and Guidance should be the overall coordinator and administrator of the Testing Program for Guidance.<sup>9</sup>

The meeting in Helena on August 7, 1947 laid the foundation for the state wide testing program. The Policy Committee laid down some basic principles in its discussion.<sup>10</sup> The Committee agreed:

1. That Guidance Services include personal, health, civic, group-life, and vocational orientation.
2. That all teachers are counselors and that the vocational counselor is a consultant to whom students can go for additional suggestions in regard to understanding their interests, aptitudes, achievement, and personality.
3. That the individual inventory or counseling folder is basic to adequate Guidance Services in a school and that testing is only one phase of this record and its pertinent data concerning the pupil.

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<sup>8</sup>Members of the Committee were Russell Bolin, L. O. Brockmann, Truman Cheney, Ruby Miller, Winnafern Moore, John Morton, Lillian Peterson, Marian Bainbridge, Jeannette Donaldson, Ford Slaght, J. W. Maucker, A. O. Gullidge, Jess Ragsdale, J. R. Spielman, I. W. Stam, William Straugh. Jess Ragsdale was elected chairman.

<sup>9</sup>Cheney, op. cit., p. 1.

<sup>10</sup>Ibid., pp. 2-3.

4. Tests are tools to supply facts which are supplementary to other evidence or to provide evidence not readily available or obtainable.
5. The selection of tests should consider fully the needs of the pupil, the counselor, the teacher, the administrator, and the employer.
6. Tests are of even greater service as a gauge of the significance of the other items on the individual inventory.

This group finally decided that a battery of achievement tests should be given to all sixth grade students on a state wide cooperative basis, since most students should have mastered the fundamental skills of learning by that time. This would give teachers an opportunity to diagnose difficulties and give remedial work before children enter high school. It was also decided to test the interests, aptitudes, and achievement of all juniors in the high schools of Montana on a cooperative basis. This would give teachers and counselors an opportunity to aid students in making their subject matter choices for their senior year and in making decisions regarding occupational choices and plans for education and training beyond high school.

It was felt that something should be done on a state wide basis that year so an Executive Committee was selected to meet on September 20, to select tests for the coming year on the elementary and secondary level.<sup>11</sup>

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<sup>11</sup>Members of the Executive Committee were Dr. J. W. Naucker, Jess C. Ragsdale, Dr. L. O. Brockman, Truman Cheney, and Mrs. Lillian Peterson.

The Executive Committee meeting in Helena on September 20 with Miss Ireland, State Superintendent of Public Instruction, and Dr. Selke, Chancellor of the University of Montana, made a number of important decisions regarding the testing program. Some of the decisions made were:<sup>12</sup>

1. To begin giving the tests about February 1, 1948.
2. Achievement tests will be given to all sixth graders in Montana. The Coordinated Scales of Attainment may be used.
3. Tests in the high school will be limited to interest, academic aptitude, and reading. The tests may include the Kuder Preference Record, S R A Primary Mental Abilities, and the Iowa Tests of Reading Abilities.
4. All tests will be scored without charge by the Guidance Service of the State Department of Public Instruction.
5. The Units of the University will cooperate in an advisory capacity in all phases of the program.
6. The tests which are selected this year will form only a part of the eventually complete testing program.
7. Research carried on by the Units of the University may indicate additional needs and desirable shifts of emphasis in the testing program.

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<sup>12</sup>Cheney, op. cit., p. 5.

The Advisory Committee on a Coordinated Testing Program for Montana met in Helena on November 24, 1947 to make the final arrangements for the testing program which was to begin in the spring. This committee made a number of important decisions.<sup>13</sup>

1. That the following recommendations of the Executive Committee regarding the tests to be used for the current year be adopted, namely;

(a) An academic aptitude test in grade eleven using the S R A Primary Mental Abilities.

(b) An interest test in grade eleven using the Kuder Preference Record.

(c) An achievement test in the sixth grade using the Coordinated Scales of Attainment.

2. That the minimum testing program should not concern itself with testing on a state wide basis in grades one to four at the present time although a reading readiness test for grade one would be desirable. It was also felt that an academic aptitude test and an achievement test would be of value if given in grades one to four.

3. That eventually a battery to test for academic aptitude at least three times during the twelve years of

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<sup>13</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19A (Montana Dept. Public Instruction, Div. Voc. Educ., Div. Occupational Information and Guidance), December 1947.

grade and high school would be desirable.

4. That spaced interest testing might be valuable in showing the stability, development, or non-development of interests.

5. That from the standpoint of guidance and counseling all pupils in grade school, high school, and college are equally important.

6. That workshops in Guidance be established at five units of the University in order to facilitate the training of counselors and other persons interested in guidance.

7. That a basic course in Guidance be established as a requirement in the certification of teachers.

8. That schools deciding to participate in the program must give all the tests in the program, report all scores to the Supervisor of Occupational Information and Guidance, and those using the test results should do so in a professional manner and not reveal the identity of pupils or schools.

9. That, if possible, a special fund should be established to facilitate central purchasing of tests.

In February and March of 1948, the Montana State Wide Cooperative Testing Program became a reality. Three tests were administered: The Coordinated Scales of Attainment, The S R A Primary Mental Abilities, and The Kuder Preference Record. The number of tests given and the percent of schools

participating are given in Table I.<sup>14</sup>

TABLE I

TESTS ADMINISTERED, NUMBER OF TESTS ADMINISTERED, PERCENT OF SCHOOLS GIVING TESTS, AND THE GRADE IN WHICH THE TESTS WERE ADMINISTERED IN 1947-48

Test	Grade	Number Administered	Percent of Schools Giving Tests
Coordinated Scales of Attainment	6	3994	45%
S R A Primary Mental Abilities	11	2403	49%
Kuder Preference Record	11	2114	35%

After examining the results of the program, the Committee decided that the program was off to a good start. However, much remained to be done in the way of expansion. The Advisory Committee and school administrators are working toward a gradual, systematic, and conservative expansion of the testing program which is based on the participation, findings, and experience of all the schools of Montana.

On June 25, 1948 the Advisory Committee met at Missoula and made plans for the coming year.<sup>15</sup> The committee decided to continue the tests given the preceding year. It

<sup>14</sup>Cheney, Sup. Occup. Inf. and Guidance, First Annual Report - 1947-48. (Montana Dept. Public Instruction, Div. Occup. Inf. and Guidance), 1.

<sup>15</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19G (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), June 26, 1948.

also decided that an achievement test should be given to high school students. At the suggestion of Dr. J. W. Mauker, then dean of the School of Education at Montana State University, the decision was made that the Iowa Tests of Educational Development would be given in the tenth and twelfth grades sometime early in March.

The committee also decided to form guidance sections at the various MEA district conventions to be held in October, and that a list of suggested topics and a panel of speakers would be provided. A series of conferences on guidance was also to be conducted at the various units of the University. By having guidance sections at the MEA district conventions and by providing a series of conferences on guidance, it was hoped that teachers and administrators throughout the state would see the value of a good testing program in guidance and counseling and would understand the significance of test results in guidance. More schools would also see the advantage of the State Wide Cooperative Testing Program and would be encouraged to participate, thereby making the program, as a whole, more beneficial and effective.

In November, 1948, a Sub-committee of the Advisory Committee, which was formed in October 1945 to make a survey of guidance principles and practices over a three year period, concluded its study. The committee made two identical surveys. The purposes of both were to find out the present



status of guidance services and to stimulate greater effort to improve guidance services in the schools. However, no evidence is available to indicate that the results of the two surveys were used in any way to stimulate guidance services and there is nothing to indicate that they affected the development of the Testing Program to any extent. However, since the first survey in 1946, guidance services at the State University and at the other units have been increased by providing training through guidance conferences, extension courses, summer schools and the regular program of instruction.

During the 1948-49 school year the tests in the State Wide Cooperative Testing Program were administered as scheduled. The Iowa Tests of Educational Development were given in addition to the Kuder Preference Record, S R A Primary Mental Abilities and the Coordinated Scale of Attainment which were administered the previous year.

Table II shows the number of tests given in the 1948-49 school year and the percent of schools participating in the program.<sup>16</sup>

The results were rather disappointing because there was a decided drop in the number of tests given in all three

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<sup>16</sup>Cheney, Sup. Occup. Inf. and Guidance, Second Annual Report 1948-49, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guid.), 1-3.

batteries from the previous year. However, the number of schools administering the IED tests was satisfying.

TABLE II

TESTS ADMINISTERED, NUMBER OF TESTS ADMINISTERED, PERCENT OF SCHOOLS GIVING TESTS, AND THE GRADE IN WHICH THE TESTS WERE ADMINISTERED IN 1948-49

Test	Grade	Number Administered	Percent of Schools Administering Tests
Coordinated Scales of Attainment	6	2357	35%
Kuder Preference Record	11	1134	19%
SRA Primary Mental Abilities	10	1463	27%
Iowa Tests of Educ. Development	12	4184	41%

On May 5, 1949 the Advisory Committee met in Helena to select tests for the coming year.<sup>17</sup> The decision was made that in addition to the four tests used in the previous year, the Metropolitan Reading Readiness Test would be given to first graders, and the Henmon-Nelson Intelligence Test or the SRA Primary Mental Abilities would be given to fourth graders.

The committee also decided that fall testing would be more advantageous since the test scores would be available throughout the entire year, thereby giving teachers and

<sup>17</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19 (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), August 1949.

counselors an opportunity to use test results for individual and group counseling and as a basis for remedial work.

The State Wide Cooperative Testing Program got under way for its third year in the fall of 1949. In addition to the four tests which were administered the previous year, the Metropolitan Reading Readiness Test was given to first graders and the Henmon-Nelson Intelligence or the SRA Primary Mental Abilities were administered to fourth graders. Table III summarizes the total number of tests given in the 1949-50 school year.<sup>18</sup>

TESTS ADMINISTERED, NUMBER OF TESTS ADMINISTERED, PERCENT OF SCHOOLS GIVING TESTS, AND THE GRADE IN WHICH THE TESTS WERE ADMINISTERED IN 1949-50

Test	Grade	Number Administered	Percent of Schools Administering Tests
Coordinated Scales of Attainment	6	1314	15%
S R A Primary Mental Abilities	11	1677	30%
Kuder Preference Record	11	1239	20%
Iowa Tests of Educ. Development	10 & 12	4512	43%
Henmon-Nelson Intelligence	4	665	7%
S R A Primary Mental Abilities	4	181	2%
Met. Reading Readiness	1	1124	18%

<sup>18</sup>Cheney, Sup. Occup. Inf. and Guidance, Third Annual Report 1949-50, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), 2-4

By comparing this table with the two previous tables, one can see that there has been a large drop in the number of Coordinated Scales of Attainment that were administered, while there is a small rise in the number of S R A Primary Abilities administered to Juniors. However, the number of tests administered is still not as great as it was in 1947-48. The percentage of schools giving the Henmon-Nelson Intelligence and the elementary form of the S R A Primary Mental Abilities was very small. This was probably due to such factors as lack of promotion, the type of test, age of test, inadequate instructions, and the inadequacy of the tests for the measurement of non-readers.

On August 5, 1950 the Advisory Committee met in Helena to lay plans for the 1950-51 testing program and to discuss the results from the previous year. All of the tests used that year would be used again. The committee recommended that two measures of scholastic or academic aptitude be made in the seventh through ninth grades. Ford Slaght, Superintendent of Schools at Wolf Point, Montana, was elected Chairman of the Advisory Committee, replacing J. G. Ragsdale, Principal of Billings Senior High School, Billings, Montana, who resigned after a three year period as chairman of the committee.<sup>19</sup>

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<sup>19</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19Q, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), August 15, 1950.

So far the historical development and growth of the Montana State Wide Cooperative Testing Program has been traced from its inception at the Bozeman Conference on November 24, 1943, through the first three years of its existence. All of the important meetings of the Advisory Committee have been discussed to show the evolution of the program from an idea to reality.

The next section of this chapter will deal with the purposes of testing and the philosophy of the testing program.

#### THE PHILOSOPHY AND PURPOSES OF THE STATE WIDE TESTING PROGRAM

When the Advisory Committee met for the first time at Bozeman the committee decided that "guidance is a process of helping an individual to discover, to develop, and to utilize his interests and abilities within the framework of a representative democracy."<sup>20</sup> It may be noted that guidance is considered a process that is carried on from the time a child enters school until he leaves. It was with this definition in mind that the Advisory Committee established the State Wide Cooperative Testing Program. The Advisory Committee looked upon testing as a tool to be used by teachers and

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<sup>20</sup>Smith, Supervisor of Distributive Education, Bulletin by State Department of Public Instruction, Div. Voc. Educ., Div. Distributive Education, May 1943.

counselors in the process of guidance.

Purposes of the program. The purposes of the State Wide Cooperative Testing Program are threefold: Its most important purpose is to obtain more complete information about each individual pupil so that schools can do a better job of adapting their instruction to meet the pupil's particular needs and to develop his abilities to the limit of his capacities. Second, to provide additional facts which may be added to all the other information so that each individual will be counseled in the light of all possible information. Third, to provide information which will enable administrators to evaluate the effectiveness of the educational program as a whole.<sup>21</sup>

It cannot be emphasized too strongly that these tests are not designed to pass or fail students, nor are the tests to be used to evaluate individual teacher proficiency nor to rate teachers and administrators.

Using tests in counseling. The purpose of testing is to determine what the status of the pupil is, and then, if necessary, to remedy or improve the situation. Testing is of value only as the results are used. There are many ways

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<sup>21</sup>Cheney, Sup. Occup. Inf. and Guidance, Third Annual Report (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), 1.

in which the test results may be used to help guide and counsel students. The principle uses of tests in counseling according to Larsen and Cheney are:<sup>22</sup>

1. Locating and identifying persistent weaknesses of an individual as might be discovered from repeated tests and setting up remedial plans based on the results and other available data.

2. Assisting students by means of objective test data to work for highest individual growth. This would include the encouragement that should come from improvements noted in continuous test data as well as stimulation aroused by the need for higher results.

3. Studying the students in the light of his own achievement as compared to his own interests and potential ability.

4. Helping students to reach necessary social standards even in those cases where interest, aptitudes, personality, and achievement are low.

5. Assisting students toward specialization in those areas where interest, aptitude, personality, and achievement show greatest potential.

6. Assisting in personal problems of adjustment by

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<sup>22</sup>V. F. Larsen and Truman Cheney, "A Survey of Uses of Tests in the Guidance Program," Montana Education, XXIV (March, 1948), 8-9.

proper consideration of results from interest, aptitude, personality, and achievement tests.

7. Assisting students to select vocational and other areas for specialization where their greatest potentiality is evident.

8. Assisting students to develop and cultivate hobby and avocational interest.

9. Determining pupil readiness to assimilate information and skills at succeeding stages of development.

10. Determining which pupils are dangerously above or below their individual norm and helping them.

11. Helping pupils to remain in school by removing stumbling blocks caused by social or educational maladjustment.

12. Presenting objective and comprehensive evidence to parents in order to assist them in helping their children select vocations and solve other personal problems.

13. Assisting pupils in the selection of courses and elective subjects which they feel are suited to their interests, abilities, and achievements.

14. Providing meaningful data to other schools, to colleges, and to employers which will assist in the adjustment of the individual.

15. Helping parents to recognize the strengths and weaknesses of their children to utilize this knowledge by



encouraging them toward obtainable objectives.

Principles of testing. The Advisory Committee recommends that all teachers and administrators keep the following principles in mind when administering and interpreting tests.<sup>23</sup>

1. Tests are tools to supply facts which supplement the knowledge known about a given individual or which provide facts not available by other means.

2. Test scores are most significant when the results are confirmed by other data. Test scores by themselves are not very significant but may have to be relied upon when no other information is available.

3. Test scores indicate individual differences.

4. Test scores may reveal ways in which the school can serve individual pupils or groups of pupils more effectively.

5. Tests are used for the furthering of education as related to diagnosis, planning, development, adjustment, and achievement by pupils.

6. Test directions should be carefully studied and followed if the results are to be valid.

7. Test results should only be interpreted by ex-

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<sup>23</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGb-19M, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance).

perienced individuals.

Conclusion. Briefly stated, the entire State Wide Cooperative Testing Program is designed to help, in every possible way, all the school children in Montana to become happy, well adjusted citizens, doing the type of work they are most qualified to do. The tests administered are tools designed to aid teachers, counselors, and administrators in the guidance process. When the tools, or tests, are no longer useful the program will have lost its effectiveness, and new tools should be obtained.

#### THE TESTS USED IN THE STATE WIDE COOPERATIVE TESTING PROGRAM

The purpose of this section is to discuss the tests used in the testing program and the reason for their selection.

The Coordinated Scales of Attainment by M. J. Van Wageningen, L. J. Brueckner, A. Dvorak, and others was published in 1947 by the Educational Test Bureau of Minneapolis. The test, administered in the sixth grade, is a general achievement test designed to measure what is taught in school. It is a battery of nine tests covering the fields of Spelling, Reading, English, History, Geography, Science, Literature, Arithmetic, Computation, and Arithmetic Problem Reasoning.

This battery was selected because it was considered by the committee to be one of the best achievement tests on the market. The basis for this conclusion rested on the fact that the level of performance is measured rather than speed and at least seventy percent of the items deal with material commonly taught in that grade. The test is easy to score and interpret and the scores may be easily translated into percentile ranks.<sup>24</sup> The tests were also constructed by subject matter specialists.

The Kuder Preference Record by G. F. Kuder was published in 1942 by Science Research Associates of Chicago. Administered to the eleventh grade, this is an interest test which measures interest in nine occupational fields; mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical.

The Kuder Preference Record was selected because it is recognized as one of the best interest tests available on the high school level. It is easy to administer and score and is inexpensive. The Kuder is valuable in the selection of subjects, hobbies, and vocations.<sup>25</sup>

The SRA Primary Mental Abilities by L. L. Thurstone

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<sup>24</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19F, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance).

<sup>25</sup>Loc. cit.

and T. G. Thurstone, was published by Science Research Associates of Chicago. This test administered to the eleventh grade also, is an academic aptitude test which measures five "primary mental abilities," verbal meaning, space, number, reasoning, and word fluency.

The test was selected because its total score gave an Intelligence Quotient comparable to other intelligence tests; it also gave single scores in each of the five primary mental abilities. This makes it very valuable for educational and vocational guidance. It is also one of the most popular of the new intelligence tests which recognizes several components of academic aptitude.<sup>26</sup>

The Iowa Tests of Educational Development by J. W. Maucker, Paul Bloomer, K. W. Vaughn, and Julia Peterson was published in 1942 by Science Research Associates in Chicago. This test was administered to the tenth and twelfth grades. It is a battery of nine tests designed to measure the educational growth of a student as well as to acquaint the teacher with the general background which the pupil brings to each of the major fields of instruction. The tests in the battery are: (1) understanding of basic social concepts, (2) background in the natural sciences, (3) correctness in writing, (4) ability to do quantitative thinking, (5) ability to

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<sup>26</sup>Loc. cit.

interpret reading material in the social studies, (6) ability to interpret reading material in the natural sciences, (7) ability to interpret literary material, (8) general vocabulary, and (9) uses of sources of information.

These tests were selected because they measure both factual knowledge and ability to think. They are valuable for the purposes of educational guidance and curriculum evaluation. They are the newest and some of the most comprehensive tests of general achievement in nine high school areas.<sup>27</sup>

The Metropolitan Reading Readiness Tests by G. H. Hildreth and N. L. Griffiths was published by World Book Company in Yonkers, New York, in 1939. This is a battery of seven tests administered in the first grade and designed to identify children who are not mature enough to profit by ordinary first grade instruction.

The test was selected because it was considered one of the best tests on the market. It measures reading readiness, writing readiness, and arithmetic readiness and gives the teacher a quick survey of backgrounds and immediate potentialities of the pupils.<sup>28</sup>

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<sup>27</sup>Loc. cit.

<sup>28</sup>Cheney, Sup. Occup. Inf. and Guidance, Third Annual Report, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance), 1.

Henmon-Nelson Test of Mental Ability by V. A. C. Henmon and M. M. Nelson was published in Boston by Houghton-Mifflin Company in 1932. The Henmon-Nelson Test was used in grade four. It is a well known and widely used academic test, measuring general intelligence and containing a wide variety of items that are not arranged in any particular sequence. Spatial as well as verbal and numerical materials are employed.

This test was chosen because the committee favored at least one of the general group factor tests of intelligence for each pupil to be used largely as a check on other tests which are more valuable for broader counseling.<sup>29</sup> It is valuable as a rough classification of broad groups and it is easy to score and administer.

The Elementary form of the SRA Primary Mental Abilities, by L. L. Thurstone and G. T. Thurstone is an academic aptitude test which measures the same five "primary mental abilities" listed in the previously mentioned SRA Primary Mental Abilities test. This test was administered to the fourth grade.

This elementary test was selected because it distinguishes the aptitudes of the student which makes it val-

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<sup>29</sup>Loc. cit.

uable in educational and vocational guidance.

Summary. In this chapter, the development and growth of the state wide testing program have been traced from its inception at Bozeman in 1943 through 1950. The purpose of testing and the philosophy of the program have been discussed; a brief perusal of the tests used has also been included.

The Bozeman Conference in 1943 brought out the need for a minimum state wide guidance program and established some basic principles. At Helena on August 7, 1947 the bases for the present testing program were adopted and on November 24, 1947 the final arrangements were made for the tests to be administered in the early part of 1948. Since then three state wide testing programs have been administered and a fourth one is now under way. The number of schools participating in the program is quite encouraging, but it is too early yet to determine a definite trend as to whether the schools will continue to participate in the state wide program or whether they will drop it in favor of their own.

## CHAPTER III

### A DISCUSSION OF THE PRIMARY MENTAL ABILITIES

The SRA Primary Mental Abilities used in the Montana State Wide Cooperative Testing Program will be discussed in this chapter in order to determine its value as a tool in guidance. This test was selected because it is considered very valuable for educational and vocational guidance.<sup>1</sup>

The Primary Mental Abilities by L. L. Thurstone and T. G. Thurstone have been developed through a series of research studies extending over a period of fifteen years, and is an attempt to provide practical batteries of tests to implement their work in the isolation of primary mental abilities. Thurstone<sup>2</sup> states that the first purpose of the PMA is to identify and define the independent factors of the mind and secondly, to prepare a set of tests of psychological significance and practicable adaptability to the school's testing and guidance program. She admits that several abilities have been identified but as yet they have not been sufficiently isolated and that the results should be inter-

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<sup>1</sup>Cheney, Sup. Occup. Inf. and Guid., Bulletin OIGB-19F, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance).

<sup>2</sup>T. G. Thurstone, "Primary Mental Abilities of Children," Educational and Psychological Measurement, 1:105-116, No. 1, 1941.



preted with caution.

Description. These tests were standardized on over 18,000 pupils in the upper grades and in high schools in the Chicago area. While this means that the norms are not truly national, they do represent the school population of one of our largest cities and provide useful norms. This battery is a shortened and simplified version of the Chicago Tests of Primary Mental Abilities, which is a battery of eleven tests measuring six primary mental abilities taking two hours to complete. Through selecting the purest item types from the longer tests and omitting the test of memory the administration time has been reduced to about forty or forty-five minutes.<sup>3</sup> The five mental abilities used in this battery are: Verbal meaning, Space, Reasoning, Number, and Word-fluency.

Verbal Meaning (V) is the ability to understand ideas expressed in words. It is needed in activities where one gets information by reading or listening. High ability in V is especially useful in such school courses as English, foreign languages, shorthand, history and science.

The student is given four minutes to complete fifty problems.

Space (S) is the ability to think about objects in two or three dimensions. Blueprint reading, for example, requires this ability. S is helpful in geometry, mechanical drawing, art, manual training, physics, and geography classes.

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<sup>3</sup>L. L. Thurstone and T. G. Thurstone, Examiner Manual for the SRA Primary Mental Abilities, (Chicago: Science Research Associates, 1947), p. 2.

The student is given five minutes to work twenty problems.

Reasoning (R) is the ability to solve logical problems--to foresee and plan. The higher a student goes in school, the more R he needs for success. Understanding science and mathematics takes a lot of R.

The student is given six minutes to work thirty problems.

Number (N) is the ability to work with figures--to handle simple quantitative problems rapidly and accurately. N ability is useful for school success in business arithmetic, accounting, bookkeeping, and statistics.

The student is given six minutes to work seventy problems.

Word-fluency (W) is the ability to write and talk easily. People to whom words come rapidly and fluently are high in W. Being high in W helps in drama classes, public speaking, radio acting, debate, speech, and journalism.

The student is given five minutes to write as many words as he can beginning with the letter "s".<sup>4</sup>

The reliabilities were computed on each sub-test of the PMA for 500 pupils in the tenth grade. The reliability for each sub-test is: V, .92; S, .96; R, .93; N, .89; W, .90; and Total, .93. The authors state that these tests are reliable enough to be used for individual as well as group guidance.<sup>5</sup> The data published thus far indicate that the reliabilities on the scores are high. However, these data are not conclusive as they are based on the application of the Spearman-Brown formula to split half correlations.

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<sup>4</sup>Ibid., pp. 1-2.

<sup>5</sup>Ibid., p. 7.

It is well known that the Spearman-Brown formula tends to overpredict reliability, especially when the scores are to some degree a function of speed of work as they definitely are in these sub-tests of the PMA.<sup>6</sup>

Traxler,<sup>7</sup> questioning the reliabilities of the PMA, administered the tests to all the pupils in an independent high school for two successive years. Thus two scores were obtained a year apart on the different primary mental abilities. The test-retest correlations were found in each of the three grades. In averaging the correlations for each of the three grades for each test, the correlations ranged from .880 to .745. All of these correlations were substantial and indicated a considerable stability in the primary abilities scores over a period of a year.<sup>8</sup> An inspection of the test-retest correlations for various other tests indicates that they are usually between .60 and .85. Thus the scores on the sub-test seem to be as stable as those for most other aptitude tests and various achievement tests.

The coefficient of correlation between each of the five sub-tests range from .10 to .33. Thus according to

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<sup>6</sup>A. E. Traxler, "Stability of Scores on the Primary Mental Abilities Tests," School and Society, 53:255-256, April, 1941.

<sup>7</sup>Loc. cit.

<sup>8</sup>Thurstone and Thurstone, op. cit., p. 7.

Thurstone, five independent aspects of intellectual behavior are being measured. Table IV shows the intercorrelations of the PMA to be low with the possible exception of the correlation between the Verbal and the Reasoning test which is somewhat higher.

TABLE IV  
CORRELATION BETWEEN FACTORS OF THE  
SRA PRIMARY MENTAL ABILITIES<sup>9</sup>

	N	V	S	W	R
N	1.000				
V	.168	1.000			
S	.097	.178	1.000		
W	.248	.290	.120	1.000	
R	.207	.326	.238	.273	1.000

The longer Chicago Tests of Primary Mental Abilities have slightly higher correlations as indicated by Crawford who found that the intercorrelations for the same tests as shown above ranged from .295 to .390.<sup>10</sup> The lower intercorrelations of the SRA (PMA) are due to the selection of the purest item types from the longer forms.

Spearman<sup>11</sup> in analyzing Thurstone's work declares that Thurstone does not break up the general factor of intel-

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<sup>9</sup>Ibid.

<sup>10</sup>A. B. Crawford, "Some Observations on the Primary Mental Abilities Battery in Action," School and Society, 51: 585-592, May, 1940.

<sup>11</sup>C. Spearman, "Thurstone's Work Re-Worked," Journal of Educational Psychology, 30:1-16, January, 1939.

ligence into primary mental abilities, but merely breaks it up into fragments and then by heaping, leveling, or scattering to fit his theories, he produces the condition he desires. Spearman is led to the view that group factors, far from constituting a small number of sharply defined mental abilities, are endless in number, indefinitely varying in scope, and even unstable in existence. He believes that it introduces numerous statistical values that are mentally unintelligible and that it leads back to the theory of mental faculties by reducing ability to a number of more or less watertight compartments.

Spearman firmly believes that a measure of "general" intelligence is much more important than breaking up intelligence into a number of factors and thus his analysis should be interpreted with this fact in mind.

However, it appears safe to say at this point that since Thurstone breaks down intelligence into a number of factors, the subjects that one takes and the vocations one enters should also be broken down into the number of factors, to the varying degrees, that are required for success in a particular subject or vocation. Then the tests would be valuable in guidance work. So far, however, this has not been done to any great extent. If and when this is done it would take trained personnel to properly interpret and use these results in counseling. Only a very well trained

teacher well versed in statistical analysis, would be qualified to use these results and, thus, its use as a tool for guidance purposes would be greatly curtailed.

Previous studies. One of the most crucial problems that confronts the educator of today is that of correctly advising students as to their educational and vocational careers. In conjunction with this problem, educators and psychologists are constantly working to secure more reliable and accurate information to use in counseling students. Shanner and Kuder,<sup>12</sup> in trying to find the predictive value of several tests, used the PMA tests, A.C.E. Psychological Examination, Pressey's Special Reading Test, two especially constructed aptitude tests, and a vocabulary test and correlated them with comprehensive examinations given to freshmen at the University of Chicago. They found that the two especially constructed aptitude tests yielded the highest validity for the appropriate subjects and validities at least as high as any other tests for average grades. Table V shows the correlations between the tests and the average examination grades.

The table shows that the only PMA test that correlated

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<sup>12</sup>W. M. Shanner and G. Frederic Kuder, "A Comparative Study of Freshmen Week Tests Given at the University of Chicago," Educational and Psychological Measurements, 1:85-92, No. 1, 1941.

substantially with grades was the Verbal test and that was only .415. The A.C.E., the special aptitude tests, the vocabulary test, and Pressey's Special Reading Test all had higher correlations with grades and appear to be better at predicting grades than the PMA.

TABLE V

CORRELATION BETWEEN TESTS OF GENERAL, SPECIAL, AND PRIMARY MENTAL ABILITIES WITH AVERAGE EXAM. GRADES<sup>13</sup>

Test	Correlations
PMA: Perception	.117
Number	.310
Verbal	.415
Spatial	.184
Memory	.204
Induction	.229
Deduction	.378
ACE Psychol. Exam.	.523
Physical Science Aptitude	.522
Social Science Aptitude	.575
Pressey's Reading Test	.477
Vocabulary	.486

Yum<sup>14</sup> made a similar study at Chicago in 1941 when he studied the relationship between primary mental abilities and scholastic achievement. Rather than using grades on examinations, he used the final grades of students taking the course, which would be a better indicator of scholastic success. His correlations were slightly lower than those

<sup>13</sup>Ibid., p. 87.

<sup>14</sup>K. S. Yum, "Primary Mental Abilities and Scholastic Achievement in the Divisional Studies at the University of Chicago," Journal of Applied Psychology, 25:712-720, 1941.

obtained by Shanner and Kuder. In addition, he found that the multiple coefficients between various combinations of the primary mental abilities and averaged grade points, seem to indicate that a combination of the verbal tests and reasoning could be used for the purpose of predicting scholarship in colleges about equally well as a combination of all the primary mental abilities.

In his studies, Yum also found that sex differences existed on some of the primary mental abilities. The outstanding sex difference was that the number factor seemed to correlate with scholarship consistently higher in women's groups than men's.

Ellison and Edgerton<sup>15</sup> made correlations between the PMA tests and grades in specific courses with forty-nine students at Ohio State University. They found that the correlation between the Verbal test and English grades was .75 and for science grades the correlation was .68. For other courses the correlations ranged from .44 to .59. The correlation between grades and the other PMA tests ranged from -.12 to .33 with the exception of the correlation between Foreign language grades and the Inductive Reasoning Test which was .78.

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<sup>15</sup>M. L. Ellison and H. A. Edgerton, "The Thurstone Primary Mental Abilities Tests and College Marks," Education-  
al and Psychological Measurement, 1:399-406, 1941.



Studies by Goodman<sup>16</sup> at Pennsylvania State College indicate again that the Verbal tests yielded significant correlations for all courses except Drawing. He also found the correlation between the Otis and Grade Point averages was .53 while for the Verbal test it was .51. Goodman also reproduces part of a study by Tredick to show the correlations between the PMA tests and tests of general ability. Table VI shows the correlations between the Otis and grade point averages with the sub-tests of the PMA.

TABLE VI  
CORRELATIONS BETWEEN THE OTIS AND GRADE POINT  
AVERAGE WITH THE PMA<sup>17</sup>

	Primary Mental Abilities						P
	P	N	V	S	M	I	
Grade Point Ave.	.28	.41	.51	.28	.20	.40	.42
Otis	.53	.33	.68	.40	.29	.60	.61

All of the sub-tests of the PMA have moderate to high correlations with the Otis. Goodman concludes that the PMA tests correlate, on the whole, as well as most standardized intelligence tests with criteria of college success and that verbal ability correlates highest with scholastic success. He also believes that these tests correlate with individual courses to some degree and may be used to predict success.

<sup>16</sup>G. H. Goodman, "Prediction of College Success by Means of Thurstone's Primary Mental Abilities Tests," Educational and Psychological Measurement, 4:125-139, 1944.

<sup>17</sup>Ibid., p. 134.

Crawford<sup>18</sup> in his studies with 247 high school boys in the eleventh and twelfth grades found rather low correlations between the PMA and the Cooperative tests. The Verbal tests, however, correlated rather high with most of the Cooperative Tests. Table VII shows the correlation between the PMA tests and the Cooperative tests.

TABLE VII  
CORRELATION BETWEEN THE PMA TESTS  
AND THE COOPERATIVE TESTS<sup>19</sup>

Cooperative Tests	P	N	V	S	M	I	D
English	.25	.11	.65	.09	.27	.27	.29
Lit. Comprehension	.26	-.12	.66	.14	.27	.26	.32
General Science	.00	-.22	.24	-.01	-.13	.20	.16
Algebra	.32	.12	.40	.49	.12	.53	.59
Geometry	.24	.28	.42	.49	.21	.39	.67
American History	.16	.01	.59	.11	.19	.04	.22

Table VII indicates that General Science had several negative correlations and generally showed very little relationship with the PMA. Both Algebra and Geometry correlated rather high with the reasoning factors.

Evaluation of the PMA. The studies reviewed in the preceding pages make it clear that the Chicago Tests of Primary Mental Abilities while sufficiently perfected to make possible important research into the nature and organization

<sup>18</sup>Crawford, op. cit., pp. 585-592.

<sup>19</sup>Ibid., p. 588.

or human abilities, still need to be improved before they become a practical instrument for use in guidance and selection. Crawford indicated that the factors were somewhat impure, but this has been considerably improved by the appearance of the shorter SRA Primary Mental Abilities. Spearman declares that Thurstone does not break up intelligence into mental abilities, but merely breaks it up into fragments to fit his theories. Traxler states that speed plays too important a part in all of the tests.

The studies do indicate, however, that there is a significant correlation between the Chicago Tests of Primary Mental Abilities and other intelligence tests. There is a significant correlation between grades and the Verbal test of the PMA. Correlations between grades and the other mental studies seem to indicate that the Verbal tests can be successfully used to aid in the prediction of academic success. However, since the SRA (PMA) tests are not as long as the Chicago tests it seems reasonable to assume that its value in guidance and counseling would be somewhat reduced. No studies have been made to the knowledge of the writer, as to the value of this particular form of the PMA.

The SRA (PMA) which were selected in the Montana State Wide Cooperative Testing Program because they are useful and valuable tools in guidance, have not yet proved themselves. These tests are still a promising device for research rather than a practical tool for counselors.

## CHAPTER IV

### A DISCUSSION OF THE IOWA TESTS OF EDUCATIONAL DEVELOPMENT

The Iowa Tests of Educational Development used in the Montana State Wide Cooperative Testing Program will be discussed in this chapter to consider its value as a tool in guidance. These tests were selected because they are considered valuable for purposes of educational guidance and curriculum evaluation. They are the newest and most comprehensive tests of general achievement in nine high school areas.<sup>1</sup>

The Iowa Tests of Educational Development were developed after eighteen years of research by Dr. E. F. Lindquist of the State University of Iowa, assisted by a group of educators and test specialists. The tests were constructed for the following purposes:

1. To provide dependable measures of general educational background, growth, and development of individual pupils, thereby permitting more individualization of instruction.
2. To provide a basis for guidance in accordance with individual pupil needs.

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<sup>1</sup>Cheney, Sup. Occup. Inf. and Guidance, Bulletin OIGB-19F, (Montana State Dept. Public Instruction, Div. Voc. Educ., Div. Occup. Inf. and Guidance).

3. To provide the school administrator with a dependable and objective basis for evaluating the entire offerings of his school.<sup>2</sup>

Description. These tests were standardized on approximately 50,000 pupils in 290 high schools throughout Iowa and the neighboring states.<sup>3</sup> The battery is composed of nine tests which include, (1) a series of general background tests, one for each of the major fields of instruction, (2) a corresponding series of reading tests, (3) a general vocabulary test, and (4) a test of familiarity with, and ability to use important sources of information. A brief description of each test is given below.

Test 1. The Understanding of Basic Social Concepts test is designed to measure the pupil's general knowledge and understanding of contemporary social institutions and practices. The student is given fifty-five minutes to answer ninety items.

Test 2. The Background in the Natural Sciences test will determine the student's general knowledge and understanding of common natural phenomena, and important scientific contributions to modern civilization. The student has

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<sup>2</sup>E. F. Lindquist, Descriptive Leaflet of the Iowa Tests of Educational Development, (Chicago: Science Research Associates, 1942).

<sup>3</sup>Lindquist, Manual for the School Administrator, (Chicago: Science Research Associates, 1950), p. 34.

fifty-five minutes to answer ninety items.

Test 3. The Correctness in Writing test is designed to measure the student's mastery of the four basic elements in correct writing, punctuation, usage, capitalization and spelling. The pupil is given thirty-seven minutes to complete 204 items.

Test 4. The test on the Ability to do Quantitative Thinking will measure general problem solving ability of the practical sort. The student has sixty-five minutes to answer fifty-three questions.

Test 5. The test on the Ability to Interpret Reading Material in the Social Studies is designed to measure the student's ability to interpret, comprehend, and evaluate reading selections from textbooks, magazines and newspapers. The student has sixty minutes to complete eighty items.

Test 6. The test on the Ability to Interpret Reading Material in the Natural Sciences, like test 5, is designed to measure the student's ability to understand and analyze reading selections from science books and from scientific articles in newspapers and periodicals. The student has sixty minutes to answer eighty-one items.

Test 7. The test on the Ability to Interpret Literary Materials attempts to measure the student's grasp of the main thoughts of prose and poetry, to understand figures of speech and imagery, to recognize mood and tone in litera-

ture, and to recognize the writer's purpose. The student has fifty minutes to complete eighty items.

Test 8. The General Vocabulary test will measure not only the student's ability to handle words, but also his general aptitude for learning. The student is given twenty-two minutes to complete seventy-five items.

Test 9. The Uses of Sources of Information test will evaluate a student's ability to utilize the important sources of information available to high school students. The student is given sixty-five items to complete in twenty-seven minutes.<sup>4</sup>

The authors,<sup>5</sup> in constructing these tests, prepared a much larger number of items than were required for the finished tests. The items were then tried out on approximately 3,500 pupils in eight Iowa high schools. The items for the finished tests were then selected for discriminating power and appropriate level of difficulty on the basis of a statistical analysis of the tryout data.

The reliability of each of the first eight tests (the tests included in the composite score) was designed to yield

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<sup>4</sup>Lindquist, Manual for Interpretation and Use of the Test Results by the Classroom Teacher, (Chicago: Science Research Associates, 1943), pp. 17-39.

<sup>5</sup>Lindquist, Iowa Tests of Educational Development Manual for the School Administrator (Chicago: Science Research Associates, 1950), p. 29.

a coefficient of reliability, on the average, of .91 for pupils in a single grade in a single school. The reliability coefficients were reported in this manner, because the tests are intended to reveal differences between pupils in a single grade in a single school. Each coefficient is based on the correlation between scores on odd and even-numbered items and corrected by means of the Spearman-Brown formula by the split-half method.<sup>6</sup> Table VIII gives the reliability coefficients for the Iowa Tests of Educational Development.

TABLE VIII

RELIABILITY COEFFICIENTS FOR THE IOWA TESTS  
OF EDUCATIONAL DEVELOPMENT<sup>7</sup>

Test	Form X			Form Y		
	No. of Schools	No. of Pupils	r	No. of Schools	No. of Pupils	r
1	8	890	.92	8	851	.89
2	8	871	.86	8	847	.88
3	3	720	.92	5	672	.94
4	3	720	.86	5	672	.84
5	8	1220	.91	8	1199	.90
6	8	1041	.90	8	1022	.90
7	8	868	.90	8	850	.95
8	3	720	.93	5	672	.90
9	3	720	.84	5	673	.81

Table VIII shows that in Form Y, which was used last year in the Montana State Wide Testing Program, five tests have coefficients of reliability of .90 or above, but

<sup>6</sup>Ibid., p. 30.

<sup>7</sup>Ibid., p. 31.



in test 9 it is only .81 which is not considered high for a coefficient of reliability.

The Iowa Tests of Educational Development also have a composite score, which is the average score of the first eight tests. The composite score is considered to be equivalent to a score on a scholastic aptitude test, according to the authors, and can be used to predict academic success.<sup>8</sup>

The Iowa tests are intended to reveal differences between pupils in each of several areas and to reveal differences in achievement or ability from one area to another within the same individual. In order to determine whether these tests do measure different areas of pupil achievement or ability, it is necessary to know the relationship between the various tests in the battery to each other. If the correlations between the tests are high, it indicates that the tests measure relatively the same thing and thus will not reveal individual differences. On the other hand, if the correlations between the tests are low, it indicates that the tests do reveal differences in achievement or ability.

In order to determine whether the tests do reveal individual differences as they purport to do, the inter-correlations for the Iowa tests were computed since no correlations were available when the work was begun on this

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<sup>8</sup>Ibid., p. 33.

paper. However, since then, intercorrelations were made available through the publisher. Table IX shows the intercorrelations that were made available by the publisher for Form Y. The coefficients were computed from a sample of 670 students in grades nine through twelve from five Iowa high schools. The coefficients of correlations are of the "within grades within schools" type.<sup>9</sup>

In figuring the "within grades within schools" type of correlation, the coefficient of correlation is computed separately for each grade within each school and is then averaged to obtain the correlation that is reported in Table IX.

TABLE IX

INTERCORRELATIONS OF SCORES ON THE IOWA TESTS  
OF EDUCATIONAL DEVELOPMENT, FORM Y<sup>10</sup>

Test*	1	2	3	4	5	6	7	8	Comp	9
1.										
2.	.680									
3.	.514	.397								
4.	.684	.622	.559							
5.	.749	.605	.643	.625						
6.	.690	.664	.576	.582	.746					
7.	.658	.559	.648	.544	.781	.737				
8.	.630	.506	.693	.537	.745	.671	.753			
Comp.	.847	.762	.747	.777	.880	.843	.844	.813		
9.	.598	.556	.566	.582	.664	.671	.613	.611	.718	

\*The Iowa tests are composed of the following tests: (1) Understanding Basic Social Concepts, (2) Background in Nat. Sciences, (3) Correctness in Writing, (4) Ability to do Quantitative Thinking, (5) Ability to Interpret Material in Soc. Sciences, (6) Ability to Interpret Material in the Nat. Sciences, (7) Ability to Interpret Literary Material, (8) Vocabulary, (9) Use of sources of information.

<sup>9</sup>Ibid., p. 32.

<sup>10</sup>Loc. cit.

Table IX reveals that the intercorrelations for the Iowa tests range from .397 to .781 for the nine tests. The intercorrelations between the first eight tests and the composite score range from .747 to .880, but higher intercorrelations are to be expected since the composite score represents the average of the scores for the first eight tests. The intercorrelations of the three reading tests (tests 5, 6, and 7) range from .787 to .731 which indicates that the relationship between these three tests is quite high<sup>11</sup> and that they do not measure to any degree different types of reading ability as they purport to. The intercorrelations for the four background tests (tests 1, 2, 3 and 4) range from .397 to .634. The relationship between these four tests is moderate and indicates that they do not measure four independent areas of a student's general background, but measure relatively the same type of background material.

Intercorrelations of scores on the Iowa Tests using 121 Montana Students. Since no intercorrelations were available when this paper was begun, intercorrelations of the Iowa

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<sup>11</sup>D. E. Super, Appraising Vocational Fitness by Means of Psychological Tests (New York: Harper and Brothers, 1949), pp. 649-50. According to Super, the relationship of the coefficients of correlation are generally defined as: .80 and up, high; .50 to .80, substantial; .30 to .50 moderate; .20 to .30 slight; and .00 to .20 practically no correlation. The probable error must also be less than one fourth the size of the coefficient to be statistically significant.

tests were made using 121 students chosen at random from 2,220 juniors and seniors who took the Iowa Tests of Educational Development in the State Wide Cooperative Testing Program. Sixty-six seniors and fifty-five juniors were selected. The students selected at random, represent students from all sizes and types of high schools from the entire state.

The coefficients of correlation were computed by the Pearson-Products Moments method using Hull's arrangement.<sup>12</sup> All of the correlations were figured two times, independently, on an electric calculator to insure accuracy. Table X shows the intercorrelations of the Iowa tests using Montana students. Generally speaking, the correlations are somewhat higher than those published by the author.

The intercorrelations for the Iowa tests in Table X range from .434 to .868 for the nine tests, which is somewhat higher than those published by the author. The intercorrelations between the composite scores and the first eight tests range from .800 to .975 which is very high although a high correlation is to be expected. The correlations between the three reading tests (tests 5, 6 and 7) ranged from .773 to .868. This again proves that the rela-

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<sup>12</sup>The formula for finding the coefficient of correlation by the Pearson-Products Moments method using Hull's arrangement is:

$$r = \frac{M \text{ of } (AxB) - (M_A \times M_B)}{\sqrt{M_A^2 - (M_A)^2} \times \sqrt{M_B^2 - (M_B)^2}}$$

M = mean

$$\sqrt{M_A^2 - (M_A)^2} \times \sqrt{M_B^2 - (M_B)^2}$$

TABLE X  
 INTERCORRELATIONS OF SCORES ON THE IOWA  
 TESTS FOR 121 MONTANA STUDENTS

Test*	1	2	3	4	5	6	7	8	Comp.
1									
2	.755								
3	±.03**	.434							
4	.477	±.05	.506						
5	±.05	±.04	±.05	.642					
6	.636	.607	.656	±.04	.868				
7	±.04	±.03	±.03	±.04	±.02	.773			
8	.757	.760	.698	.612	.824	±.02	.809		
Comp.	±.03	±.03	±.03	±.04	±.02	±.03	±.02	.872	
9	.777	.760	.656	.612	.868	.975	.887	.872	
	±.02	±.03	±.03	±.04	±.02	±.03	±.02	±.01	.748
	.620	.601	.646	.481	.824	.773	.809	.872	
	±.04	±.4	±.04	±.05	±.02	±.02	±.02	±.01	
	.581	.668	.698	.491	.781	.673	.809	.872	
	±.04	±.03	±.03	±.05	±.02	±.03	±.02	±.01	
	.830	.845	.800	.806	.878	.975	.887	.872	
	±.02	±.02	±.02	±.02	±.01	±.01	±.01	±.01	
	.680	.562	.747	.531	.826	.782	.716	.740	.748
	±.04	±.04	±.03	±.04	±.02	±.02	±.03	±.03	±.03

\*The Iowa Tests are made up of the following tests:  
 (1) Understanding Basic Social Concepts, (2) Background in Nat. Sciences, (3) Correctness in Writing, (4) Ability to do Quantitative Thinking, (5) Ability to Interpret Material in Soc. Sciences, (6) Ability to Interpret Material in Nat. Sciences, (7) Ability to Interpret Literary Material, (8) Vocabulary, (9) Use of sources of information.

\*\*The figure beneath the correlation is the probable error of the coefficient correlation.

Relationship between these three tests are high and that they do not differentiate to a great extent the different types of reading ability. The correlations between the first four tests, the tests designed to measure achievement in four areas, range from .434 to .755. These correlations again

indicate that the first four tests do not measure four areas of achievement to any considerable degree.

Discussion. The intercorrelations for the Iowa Tests released by the publisher and those computed for 121 Montana students were both high. The "verbalness" of the material may be one reason why the tests correlate highly with each other. Gates<sup>13</sup> declares that the longer two highly verbal tests are, the higher the correlations between them tends to be. These tests are highly verbal, are quite long, and generally speaking, are highly correlated with each other. The intercorrelations indicate that the Iowa tests do not reveal differences in achievement from one area to another as they were designed to do. Rather, it appears that these tests measure the ability of a student to read and that its major purpose in guidance would be to measure the reading ability of a student.

There may be three reasons why the intercorrelations computed by the writer are generally higher than those reported by the publisher. First, the tests may not be as reliable as they appear because the reliability coefficients were computed for each grade within each school. Each coefficient is

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<sup>13</sup> A. I. Gates, "The Correlation of Achievement in School Subjects with Intelligence Tests and other Variables," Journal of Educational Psychology, 13:277-285, 1922.

based on the correlation between scores on odd and even-numbered items and corrected by means of the Spearman-Brown formula. It is a well known fact that the Spearman-Brown formula may be used to raise correlations spuriously high.<sup>14</sup> Second, the intercorrelations were computed by two different methods. Computing the intercorrelations by the "within grade within school" method as done by the publisher and then averaging the correlations does not appear to be mathematically sound. Computing the intercorrelations by the Hull method from ungrouped data is more apt to give a truer statement of the correlations between the various tests than does the other method. Third, the probable error has not been computed by the publisher for the intercorrelations of the Iowa Tests and the probable range within which the true coefficients of correlations lie is not known.

Previous studies. There have been no studies published reporting on the Iowa Tests of Educational Development, although there have been two theses written dealing with the relationship of test scores to school grades. In both instances the correlation between grades and scores made on the Iowa Tests have been high and indicate that they may be good predictors of academic success. Buros<sup>15</sup> reports a study

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<sup>14</sup>Traxler, loc. cit.

<sup>15</sup>O. K. Buros, Editor, The Third Mental Measurements Yearbook (New Brunswick: Rutgers Univ. Press, 1949), p. 25.

made by Busse in a review of the Iowa Tests in which Busse found the correlations between the grade point average and scores on the Iowa Tests for six small Iowa schools ranged from .44 to .94. The average correlation for the first four tests was .68. This substantial relationship indicates that the tests can be used to measure the outcomes of secondary education, at least those considered important in Iowa schools.

Lindquist<sup>16</sup> in the Iowa Tests of Educational Development Manual for the School Administrator, reports a study by Rhum in which the correlation between the composite score on the Iowa tests and college grades for 282 students was found. Rhum found that the Composite score made at the time of entrance into the twelfth grade correlated .62 with the college grade point average for the first year. The correlation between the college grade point average and the high school grade point average was .61. The Composite score on the Iowa tests proved to be as good a predictor of college success as the grade point average over the entire high school period.

Evaluation. In studying the types of items in each of the Iowa tests and the purposes for which each test was designed, one receives the impression that they are primarily a

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<sup>16</sup>Lindquist, Iowa Tests of Educational Development Manual for the School Administrator (Chicago: Science Research Associates, 1950), p. 33.



scholastic aptitude test rather than an achievement test. The tests are also highly verbal which may partly account for the high correlations found in both studies. Since they do measure relatively the same areas of pupil achievement and since they are highly verbal, it seems reasonable to assume that the area these tests measure is the ability of a student to read and that its use in guidance would be primarily to reveal which pupils could read. Pupils who scored high would be good readers and those who scored low would be poor readers. However, other than that, it will not show to any extent the specific areas in which guidance is needed. Thus, its use as a basis for guidance in accordance with individual pupil needs is somewhat questionable. The two studies reported by Buros and Lindquist indicate that a considerable relationship exists between test scores and school grades. This indicates that the tests do measure the outcome of secondary education to some degree and that they can be used to predict scholastic success to a certain extent. Nevertheless, it should be remembered that a correlation between scores and grades may have a dubious statistical reliability because of the subjective nature of assigning grades and therefore should be interpreted with care.

As yet, however, not enough is known about these tests to indicate whether they measure the growth of the pupil's general educational development and whether they provide a

more dependable and objective basis for curriculum evaluation. Probably more work needs to be done before it can be said that these tests are valuable for purposes of educational guidance and curriculum evaluation.

## CHAPTER V

### THE RELATIONSHIP BETWEEN THE IOWA TESTS OF EDUCATIONAL DEVELOPMENT AND THE SRA PRIMARY MENTAL ABILITIES

The preceding two chapters have dealt with a discussion of the SRA Primary Mental Abilities and the Iowa Tests of Educational Development and the value of each as a tool in guidance. The purpose of this chapter is to ascertain the relationship between aptitude tests and achievement tests, especially the relationship between aptitudes as measured by the PMA and achievement as measured by the Iowa Tests.

#### The relationship between aptitudes and achievement.

Aptitudes are generally assumed to be inborn characteristics and achievement is regarded as the product of training.<sup>1</sup> Actually, however, the two simply represent different emphases upon native ability and training. One's aptitudes are one's potentialities for success in a given area, but these depend on both inborn characteristics and experience. It is not possible to separate the influences of heredity and environment upon aptitude, nor would this kind of separation be of much practical importance in the prediction of success, even if it could be made. Similarly, one's achievement is

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<sup>1</sup>A. E. Traxler, "Evaluation of Aptitude and Achievement in a Guidance Program," Educational and Psychological Measurement, 6:13-16, No. 1, 1946.

the level of skill, knowledge, and understanding one has attained in a given field, and as is true of aptitudes, this level depends upon a complex of inborn traits and experiences.<sup>2</sup>

When evaluating aptitude, emphasis is placed upon native capacity by posing problems in which the individual has had no formal training. When evaluating achievement, emphasis is placed upon training and knowledge by formulating tasks dealing with material which one has studied or has had experience with.

Generally, the correlations between aptitude tests and achievement tests are quite substantial. For one hundred tenth grade students, the correlation between aptitude tests and achievement tests ranged from .46 to .60.<sup>3</sup> Kohn<sup>4</sup> found that the mean correlation for all grades in a large high school, between achievement measured by the Sones-Harry High School Achievement Test and general intelligence as measured by the Morgan Mental Test was .54. The Ohio State Psychological Examination and The American Council on Education Examination correlated .82 and .71 respectively with the Sones-Harry.

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<sup>2</sup>Traxler, loc. cit.

<sup>3</sup>E. A. Bond, Tenth Grade Abilities and Achievements (New York: Bureau of Publications, Teachers College, Columbia University, 1940), p. 30.

<sup>4</sup>H. A. Kohn, "Achievement and Intelligence Examinations Correlated with each other and with Teacher's Rankings," The Pedagogical Seminary and Journal of Genetic Psychology, 52: 433-437, 1938.

Furst<sup>5</sup> found that intelligence is as closely related to tests of knowledge as to tests of critical thinking. He found that the American Council on Education Examination correlated on the average of .45 with achievement tests of critical thinking and .42 for tests of knowledge. Crawford<sup>6</sup> found rather low correlations between the Cooperative Achievement Tests and the PMA with the exception of the Verbal test which had a mean correlation of .49 with six cooperative tests. The correlations of the other mental abilities with the Cooperative tests were considerably lower. This seems to indicate that the verbal factor of intelligence is more closely related to the type of knowledge that the Cooperative tests endeavor to measure than are the other primary mental abilities.

Thus, it can be readily seen, that intelligence tests and achievement tests are substantially related and generally speaking, the higher the score a person obtains on an intelligence test, the higher the score he will obtain on an achievement test. The relationship also tends to be greater when the material in both instances is verbal.

Relationship between aptitude tests. Generally, the relationship between tests of intelligence are somewhat

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<sup>5</sup>E. J. Furst, "Relationship between Tests of Intelligence and Tests of Critical Thinking and of Knowledge," Journal of Educational Research, 43:614-625, April, 1950.

<sup>6</sup>Crawford, loc. cit.

higher than the relationship between tests of intelligence and achievement. Kohn<sup>7</sup> in finding the intercorrelations for five intelligence tests found that the correlations ranged from .66 to .92 with a mean of .72.<sup>8</sup> Allen and Bessell<sup>9</sup> found the mean correlation between several intelligence tests to be .73. They also found the mean correlation between the non-verbal and the verbal tests to be .34 which is quite low. They concluded that non-verbal tests measure different functions and that both should be in a well-rounded testing program. Goodman<sup>10</sup> found high correlations between the PMA and the Otis, with the Verbal factor and the Reasoning factors correlating highest with correlations of .63 and .60 respectively. The memory factor and the number factor correlated lowest with .29 and .33 respectively. This again indicates that verbal and non-verbal factors measure somewhat different functions and that the non-verbal factors of intelligence are not adequately measured by a verbal intelligence test.

These studies show that the relationship between intelligence tests are a little higher than the relationship

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<sup>7</sup>Kohn, loc. cit.

<sup>8</sup>The tests Kohn used were the Kuhlmann-Anderson, Morgan Mental Test, A.C.E., Ohio State Psychol. Exam., and the Stanford-Binet.

<sup>9</sup>R. M. Allen and Harold Bessell, "Intercorrelations Among Group Verbal and Non-Verbal Tests of Intelligence," Journal of Educational Research, 43:394-5, January, 1950.

<sup>10</sup>Goodman, op. cit., p. 134.

between intelligence tests and achievement tests although there is a great deal of over-lapping. The studies also indicate that the verbal aptitude tests are more highly correlated with achievement tests than they are to non-verbal intelligence tests. In addition, they show that the verbal content in each test determines to some extent whether there will be a high or a low correlation between two intelligence tests or between an intelligence test and an achievement test. If the verbal content in both cases is high, chances are that the correlation would be higher than if the verbal content is low. This means that a general scholastic achievement test and a verbal intelligence test measure many of the same things and consequently cannot be completely separated.

Correlations between the PMA and the Iowa Tests. Since not very much is known about either one of these tests, particularly the Iowa tests, and because no known reported studies were found between the Iowa tests and the PMA, it was thought that a study of the correlations between these two tests would be of value in determining whether both of these tests have different functions as they are supposed to in the Montana State Wide Cooperative Testing Program, or whether they both serve approximately the same function. A study of this nature would also determine to some extent, whether the Iowa tests are primarily scholastic aptitude tests, as they

appear to be, in which the ability to read is the primary function measured.

In computing the correlations between these tests, the scores of all of the Montana students who took both of the tests in the Montana State Wide Cooperative Testing Program were compared. Since the PMA was administered primarily to eleventh grade students and the Iowa tests to tenth and twelfth grade students, there were scores for only 121 students available with which to make correlations. There were sixty-six seniors and fifty-five juniors. These students came from all parts of Montana and from all sizes and types of high schools so the scores on both groups of tests should be representative of the scores made on both tests throughout the state. The coefficients of correlation were computed by the Pearson-Products Moments method using Hull's arrangement. All of the correlations were computed twice, independently, by using an electric calculator to insure accuracy. Table XI shows the correlations between the PMA and the Iowa Tests of Educational Development for 121 students.

Discussion. Table XI shows that the correlations between the five PMA tests and the nine Iowa tests range in relationship from .086 to .719. The Iowa tests correlate on the whole substantially higher with the Verbal factors of intelligence than with the other primary mental abilities,



which was to be expected. The correlations ranged from .359 to .719 with a mean correlation of .573. The composite score, the average score for the first eight tests, correlated .749 with the Verbal test. This again points out the fact that the Iowa tests are largely used in measuring scholastic achievement. The three reading tests (tests 5, 6 and 7) correlated .719, .550, and .653 respectively with the Verbal test which indicated that they are largely scholastic aptitude tests.

The correlations of the Reasoning test with the Iowa tests are moderate, ranging from .237 and .478, while the composite score correlated .524 with the Reasoning test. These correlations indicate that the Iowa tests, as a whole, are not merely tests of knowledge but are tests involving a substantial amount of reasoning.

The Space test correlates rather low with the Iowa tests with correlations ranging from .086 to .335 while the composite score correlates .381 with the Space test. These are low correlations but are to be expected due to the nature and purposes of the Iowa Tests.

Correlations of the Word fluency test, ranging from .195 to .352 are rather low. This is somewhat surprising since the Verbal test correlated from moderate to high with the Iowa tests.

The total score on the PMA which is similar to the

total score on a general intelligence test, correlates substantially with the Iowa tests with correlations ranging from .362 to .598 with the composite score correlating .694. This points out the fact that the PMA and the Iowa tests correlate, on the whole, substantially with each other.

TABLE XI

CORRELATION BETWEEN THE PRIMARY MENTAL ABILITIES AND  
THE IOWA TESTS OF EDUCATIONAL DEVELOPMENT

Iowa Tests of Educational Development	Primary Mental Abilities					Totals
	Verbal Meaning	Space Test	Reason. Test	No. Test	Word Fluency	
1 Understanding Basic Social Concepts	.359 ±.05	.329 ±.05	.237 ±.06	.231 ±.06	.106 ±.06	.367 ±.05
2 Background in Nat. Sciences	.459 ±.05	.280 ±.06	.297 ±.06	.180 ±.06	.095 ±.06	.367 ±.05
3 Correctness in Writing	.686 ±.03	.276 ±.06	.478 ±.05	.377 ±.05	.263 ±.06	.598 ±.04
4 Ability to do Quan- titative Thinking	.385 ±.05	.335 ±.05	.475 ±.05	.467 ±.05	.179 ±.06	.553 ±.04
5 Ability to Interpret Material in Soc. Sc.	.719 ±.03	.199 ±.06	.391 ±.05	.321 ±.05	.336 ±.05	.553 ±.04
6 Ability to Interpret Material in Nat. Sc.	.550 ±.04	.295 ±.06	.454 ±.05	.294 ±.06	.328 ±.05	.572 ±.04
7 Ability to Interpret Literary Materials	.653 ±.04	.192 ±.06	.369 ±.05	.225 ±.06	.352 ±.05	.550 ±.04
8 General Vocabulary	.628 ±.04	.086 ±.06	.334 ±.05	.126 ±.06	.210 ±.06	.397 ±.05
Composite Score (1-8)	.749 ±.03	.381 ±.05	.524 ±.04	.186 ±.06	.363 ±.05	.694 ±.03
9 Use of Sources of Information	.715 ±.03	.294 ±.06	.417 ±.05	.220 ±.06	.310 ±.06	.547 ±.05

Evaluation. Generally speaking, the correlations between the PMA and the Iowa tests are moderate. On the basis

of these correlations, it appears that these two tests do have different functions. The correlations indicate that the Iowa tests are largely verbal which was expected, and that the three reading tests (tests 5, 6 and 7), and the Vocabulary tests are largely scholastic aptitude tests. There are also moderate correlations with the Reasoning tests which indicate that these tests do measure more than factual knowledge, namely understanding and comprehension as well.

The correlations appear to be similar to the correlations between other aptitude tests and achievement tests, although because of the nature of the PMA's, it is somewhat difficult to tell.

The Probable Errors in most instances are quite high and the range within which the true correlation lies, is quite wide. The correlations should be interpreted with that fact in mind.

## CHAPTER VI

### A REVIEW OF THE PRIMARY MENTAL ABILITIES TEST USED IN THE MONTANA STATE WIDE COOPERATIVE TESTING PROGRAM

This chapter will be concerned with a review of the SKA Primary Mental Abilities used in Montana in the State Wide Cooperative Testing Program since it was begun. Emphasis will be placed on the 1949-50 results in which the distribution of scores on the sub-tests for schools of different sizes will be shown and discussed.

Tables XII, XIII and XIV summarize the number of tests administered and the number of schools and pupils participating in the program since its inception. By comparing the tables it can be seen that in 1947-48, the first year that the testing program was in effect, more schools participated and more tests were administered than any year since. In 1948-49 there was almost a forty percent reduction in the number of tests administered and almost a fifty percent reduction in the number of schools participating. Reductions occurred in all sizes of schools except school systems with over five hundred students, in which group an additional school participated. In 1949-50 there was a slight increase in the number of tests administered over the previous year although there were still 726 fewer tests administered than there were in 1947-48. The number of tests administered in

TABLE XII

NUMBER OF PMA TEST BATTERIES GIVEN IN 1947-48\*

Size of School	School Systems	Schools Part.	Percent Part.	Pupils Part.
500 up	8	2	25	473
200-499	20	10	50	578
50-199	85	52	61	1064
Below 50	77	30	39	288
Total	190	94	49	2403

TABLE XIII

NUMBER OF PMA TEST BATTERIES GIVEN IN 1948-49\*\*

Size of School	School Systems	Schools Part.	Percent Part.	Pupils Part.
500 up	7	3	43	538
200-499	19	4	21	240
50-199	85	23	27	546
Below 50	69	18	26	139
Total	180	48	27	1463

TABLE XIV

NUMBER OF PMA TEST BATTERIES GIVEN IN 1949-50\*\*\*

Size of School	School Systems	Schools Part.	Percent Part.	Pupils Part.
500 up	7	2	29	468
200-499	23	7	30	566
50-199	81	22	27	441
Below 50	69	23	33	202
Total	180	54	30	1677

\*Cheney, First Annual Report, op. cit., p. 2.\*\*Cheney, Second Annual Report, op. cit., p. 2.\*\*\*Cheney, Third Annual Report, op. cit., p. 2.

1949-50 was still only seventy percent of the number administered in 1947-48. An attempt to explain the reasons for the decrease in the use of the PMA will be made later in the chapter.

The performance of a typical Montana student. By looking at Table XV, one can see that the median scores for the typical Montana student for the three year period have been very similar. The greatest difference is a two and one half point variation in the Word Fluency Test. Figure 1 shows the performance of the typical Montana student compared to the typical student throughout the United States. In 1947-48 the typical Montana student was below the national average in intelligence as shown by the national norms; according to the norms he was in the forty-first percentile. In August of 1949, the national norms were revised; according to the revised norms the typical Montana student was placed in the sixty-third percentile. The typical Montana student in 1948-49 and 1949-50 was now above the national average in intelligence. His intelligence increased twenty-two percentile points, or approximately eight I.Q. points. However, by looking at Table XV, one realizes that the median scores for 1947-48 are slightly higher than they were in 1948-49 and 1949-50. Yet in Figure 1 the typical Montana student was below the national average, while during 1948-49 and 1949-50,

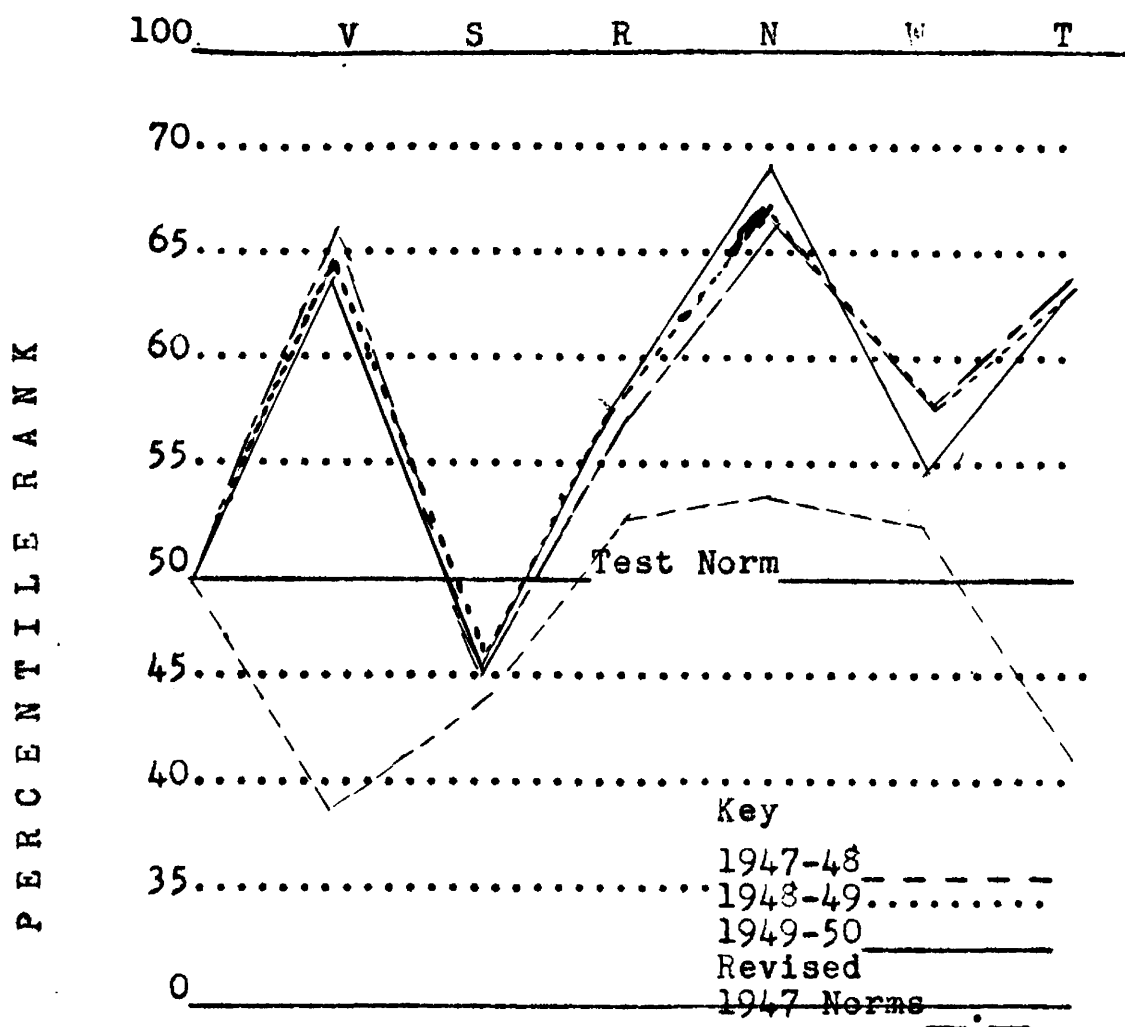


FIGURE 1

PERFORMANCE OF A TYPICAL MONTANA STUDENT\*

TABLE XV

MEDIAN SCORES FOR A TYPICAL MONTANA STUDENT ON THE PMA\*\*

	1947-48	1948-49	1949-50
Verbal Meaning	30	29	28.5
Space	24	24.5	24
Reasoning	15	16	16
Number	21	21.5	22.5
Word Fluency	44	44	41.5
Total	173	172	172

\*Data obtained from the 1st, 2nd and 3rd Annual Reports.

\*\*Data obtained from the 1st, 2nd and 3rd Annual Reports.

he was above the national average. However, when the scores of a typical Montana student in 1947-48 are plotted on the revised norms, his performance rises above the national average and becomes similar to the performance of a typical Montana student in 1948-49 and 1949-50.

Figure 1 also reveals that the typical Montana student was below the national average in the Space test, where he ranked at the forty-fifth percentile over the three year period. On the other four tests he was above the national average, especially in the Number test and the Verbal Meaning test where he ranked at the sixty-eighth percentile and the sixty-fourth percentile respectively, over the three year period. In the Reasoning test and in the Word Fluency test, he ranked at the fifty-seventh and fifty-sixth percentile, respectively.

The large decrease in the number of tests administered in 1948-49 was probably due to the fact that after school administrators saw how poorly their students did in 1947-48, they felt that the tests were not valid, or that they were not adequately standardized, or both.

The distribution of scores on the PMA for schools of different sizes. Since no information was available as to how the school systems of different sizes compared, it was thought that such a study would be of value. This tabulation

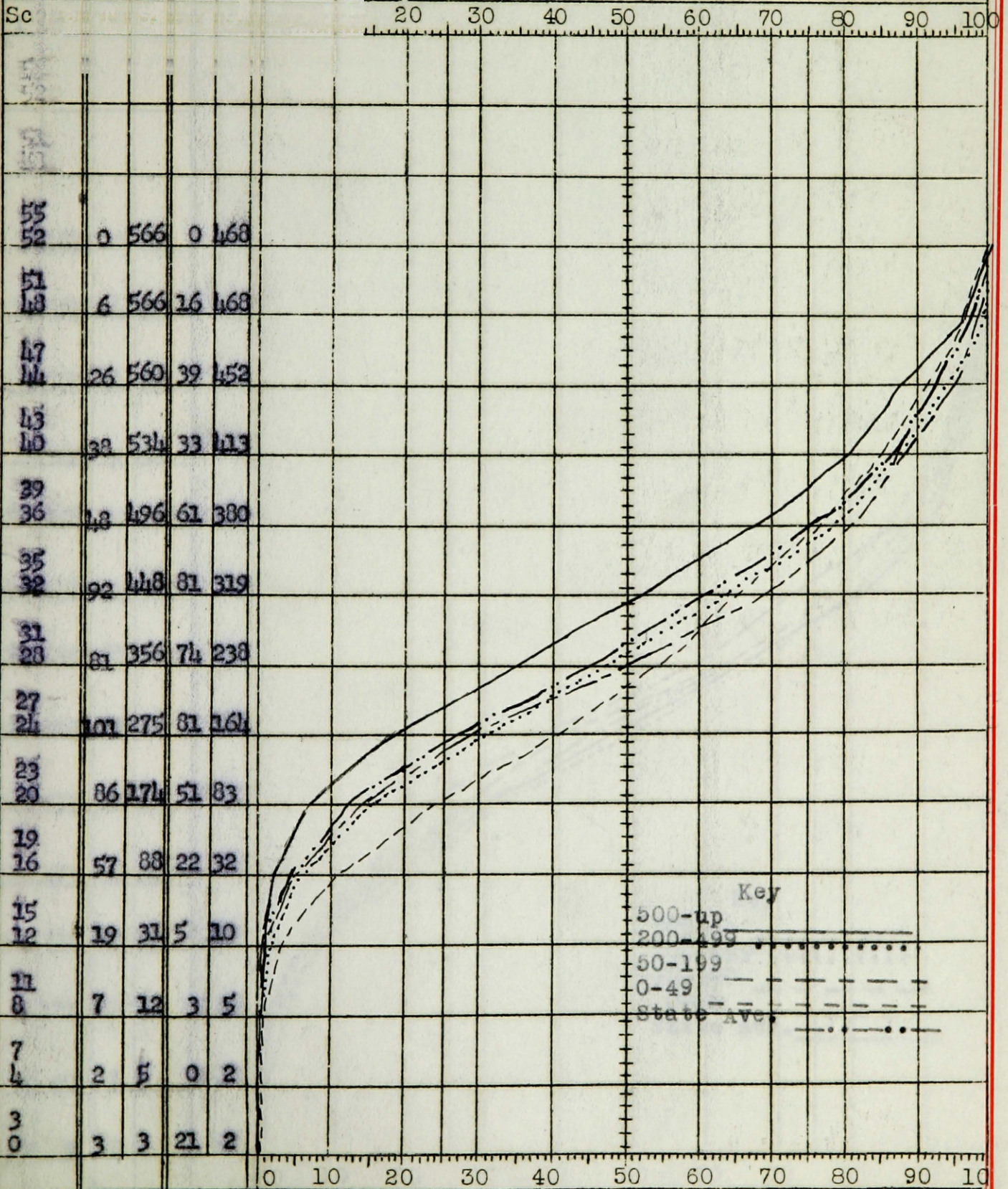


PERCENTILE GRAPH

Verbal Meaning - Mental Ability  
Montana Students 1949-50

73

Percentile Graph I



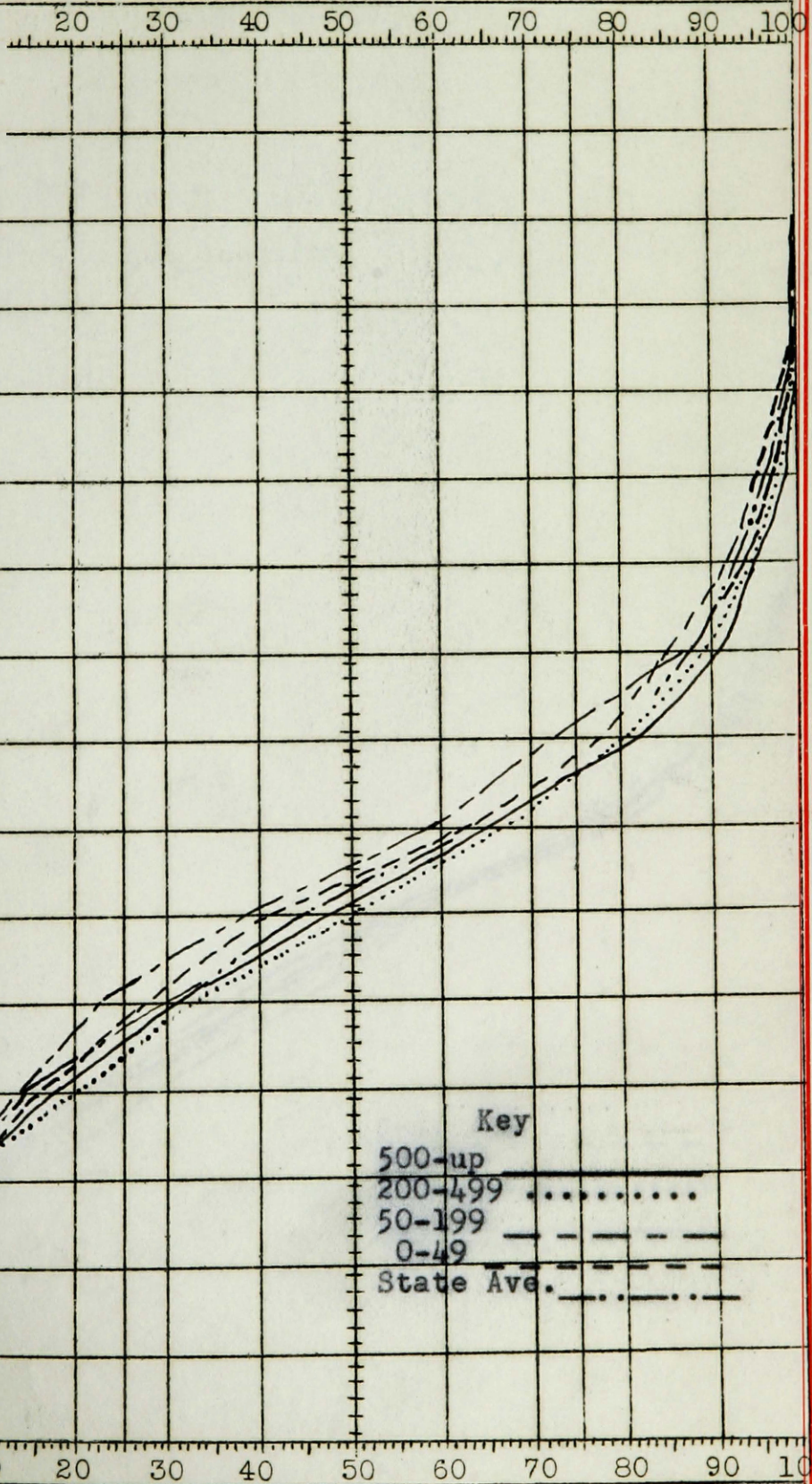


PERCENTILE GRAPH

**Space Test - Primary Mental Abilities  
Montana Students 1949-50**

Percentile Graph II

Score	I	State Ave.	Schools from 50-199	Schools from 100-up
55				
52		1 1677	0 111	1 168
51				
48		17 1676	4 111	3 167
47				
44		31 1659	11 137	5 164
43				
40		43 1628	9 126	1 159
39				
36		100 1585	30 117	3 148
35				
32		163 1485	61 387	9 125
31				
28		235 1322	62 323	5 386
27				
24		316 1087	89 261	9 311
23				
20		278 771	70 172	5 232
19				
16		202 493	40 102	5 147
15				
12		170 291	39 62	4 82
11				
8		94 121	19 23	5 38
7				
4		25 28	4 4	3 13
3				
0		2 3	0 0	0



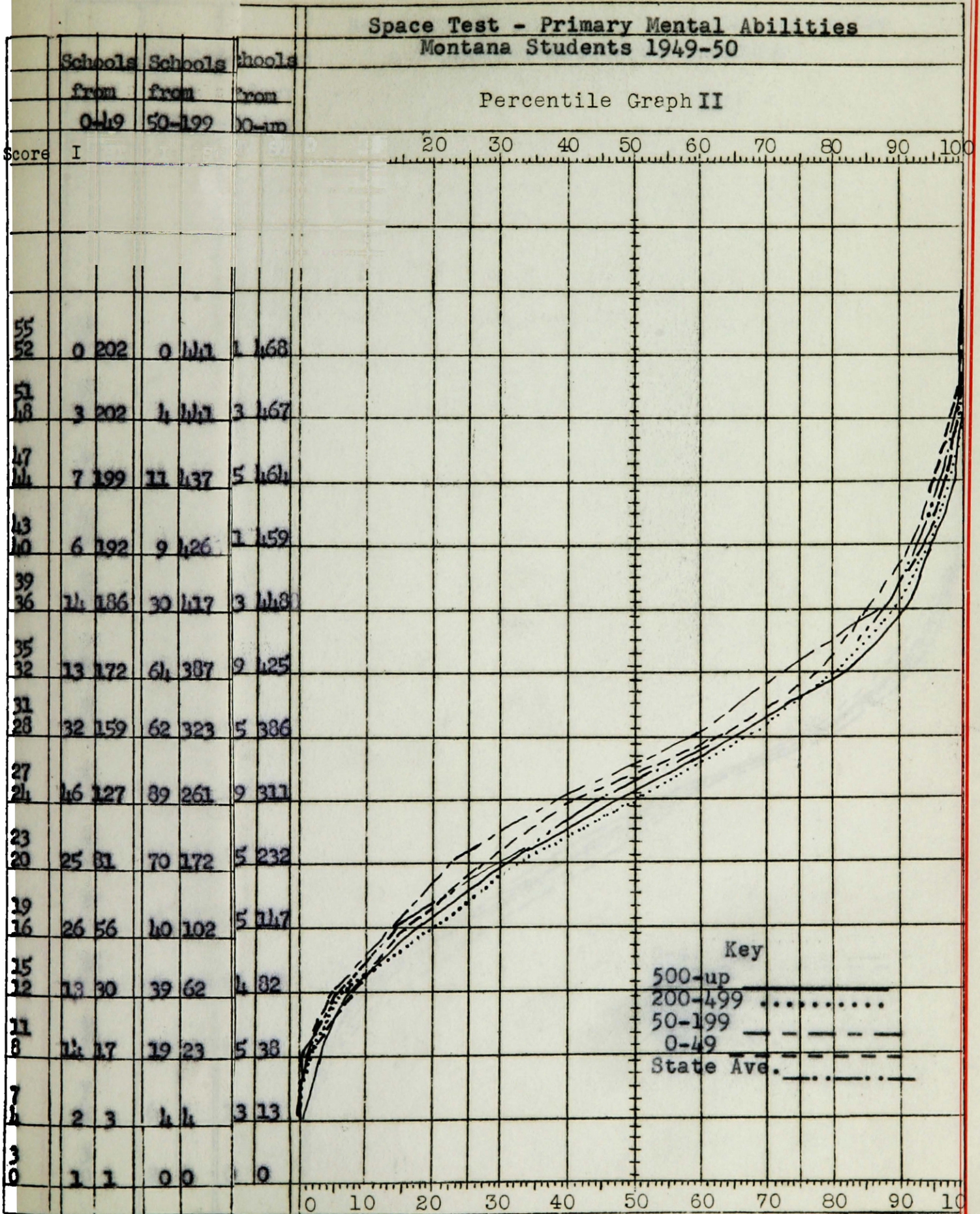
**Key**  
 500-up .....  
 200-499 .....  
 50-199 .....  
 0-49 .....  
 State Ave. ....



PERCENTILE GRAPH

Space Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph II



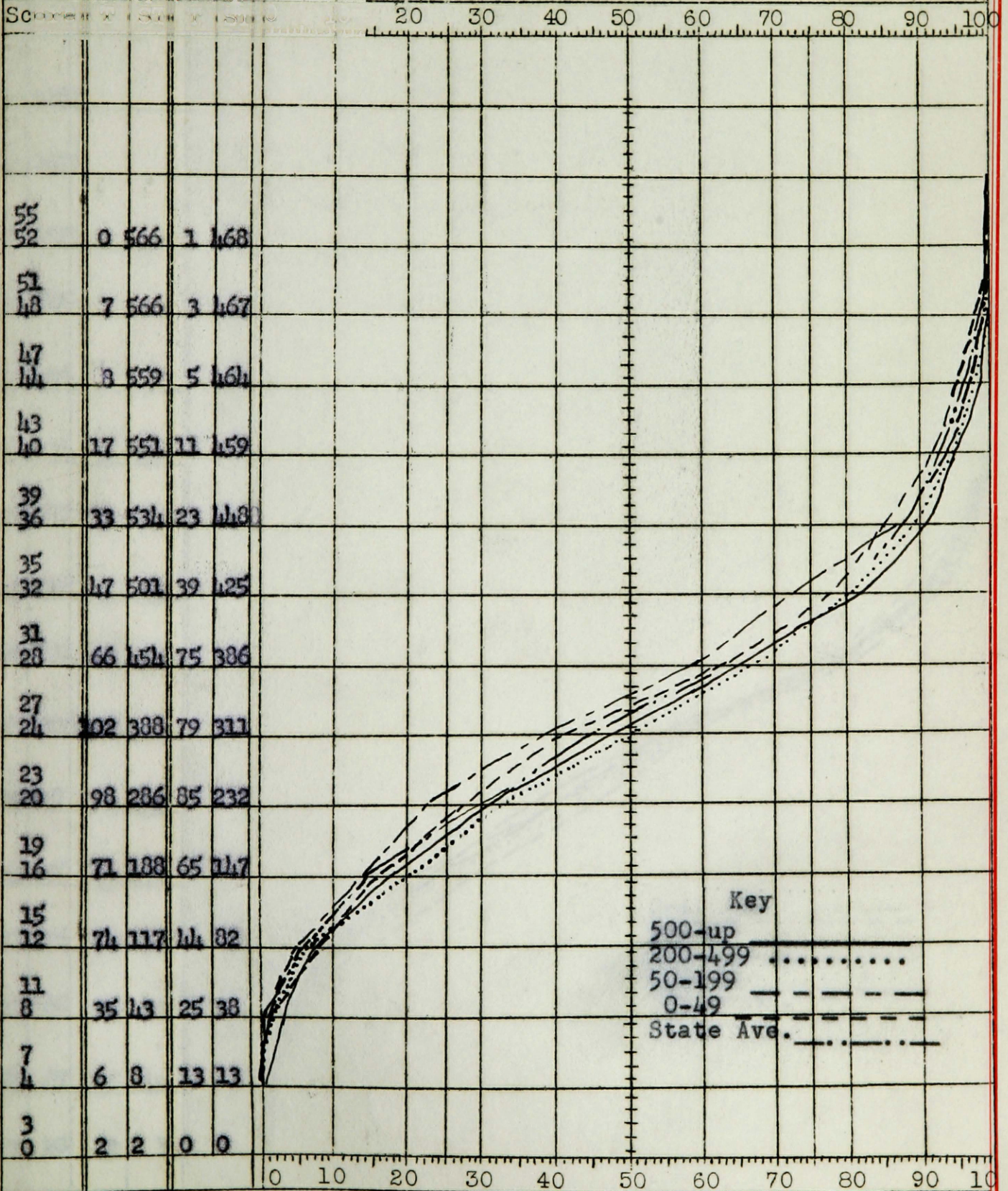
Key  
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 200-499 .....  
 50-199 - - - - -  
 0-49 ————  
 State Ave. - - - - -



PERCENTILE GRAPH

Space Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph II



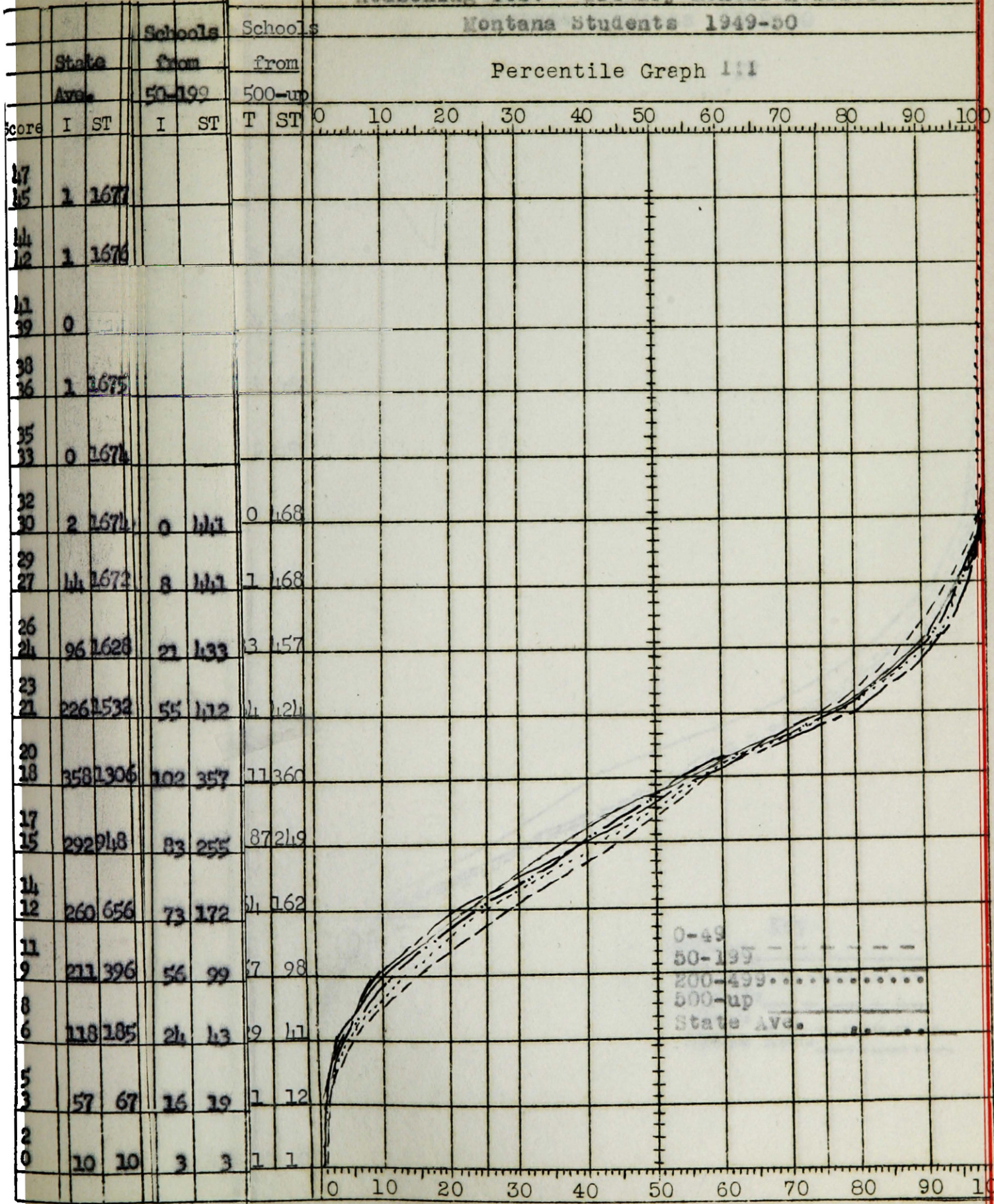
Key  
 500-up —————  
 200-499 .....  
 50-199 - - - - -  
 0-49 - · - · - ·  
 State Ave. ————



PERCENTILE GRAPH

Reasoning Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph 1:1



0-49 - - - - -  
50-199 - - - - -  
200-499 .....  
500-up - - - - -  
State Ave. - - - - -



PERCENTILE GRAPH

Reasoning Test - Primary Mental Abilities

Montana Students 1949-50

Percentile Graph 111



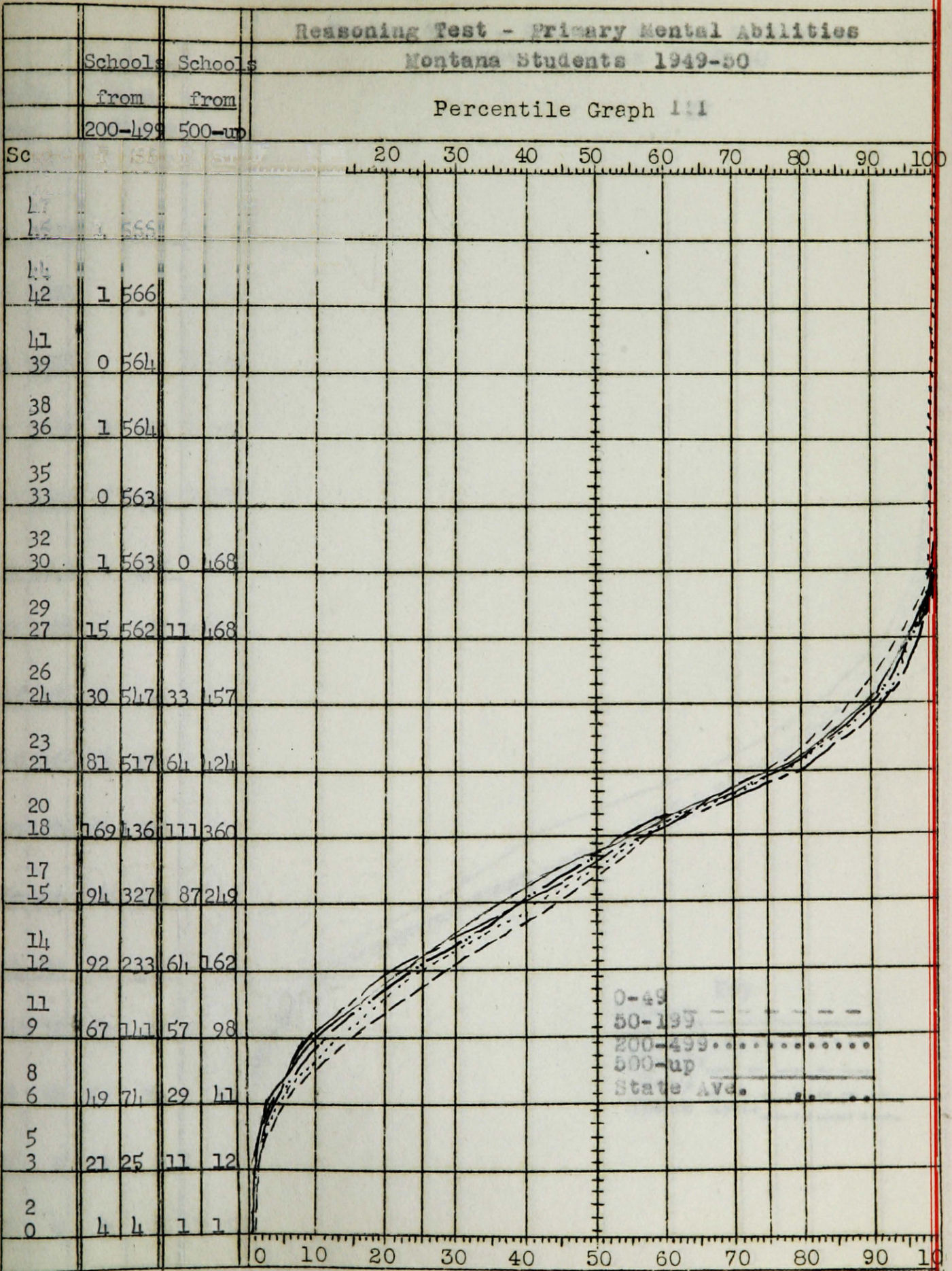
0-49 —————  
 50-199 - - - - -  
 200-499 .....  
 500-up - · - · -  
 State Avg. . . . .



PERCENTILE GRAPH

Reasoning Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph 111



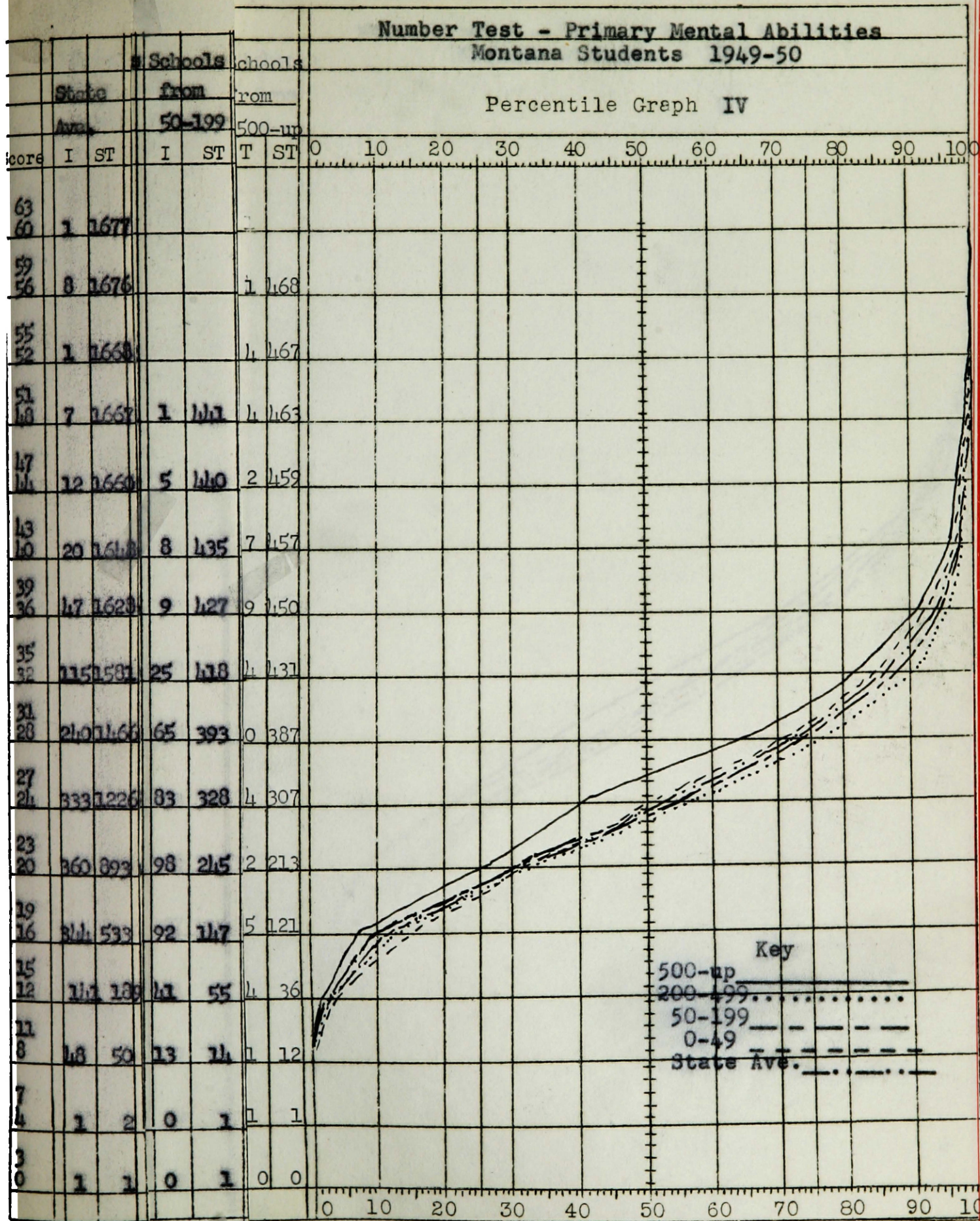
0-49  
50-199  
200-499  
500-up  
State Ave.



PERCENTILE GRAPH

Number Test - Primary Mental Abilities  
Montana Students 1949-50

76

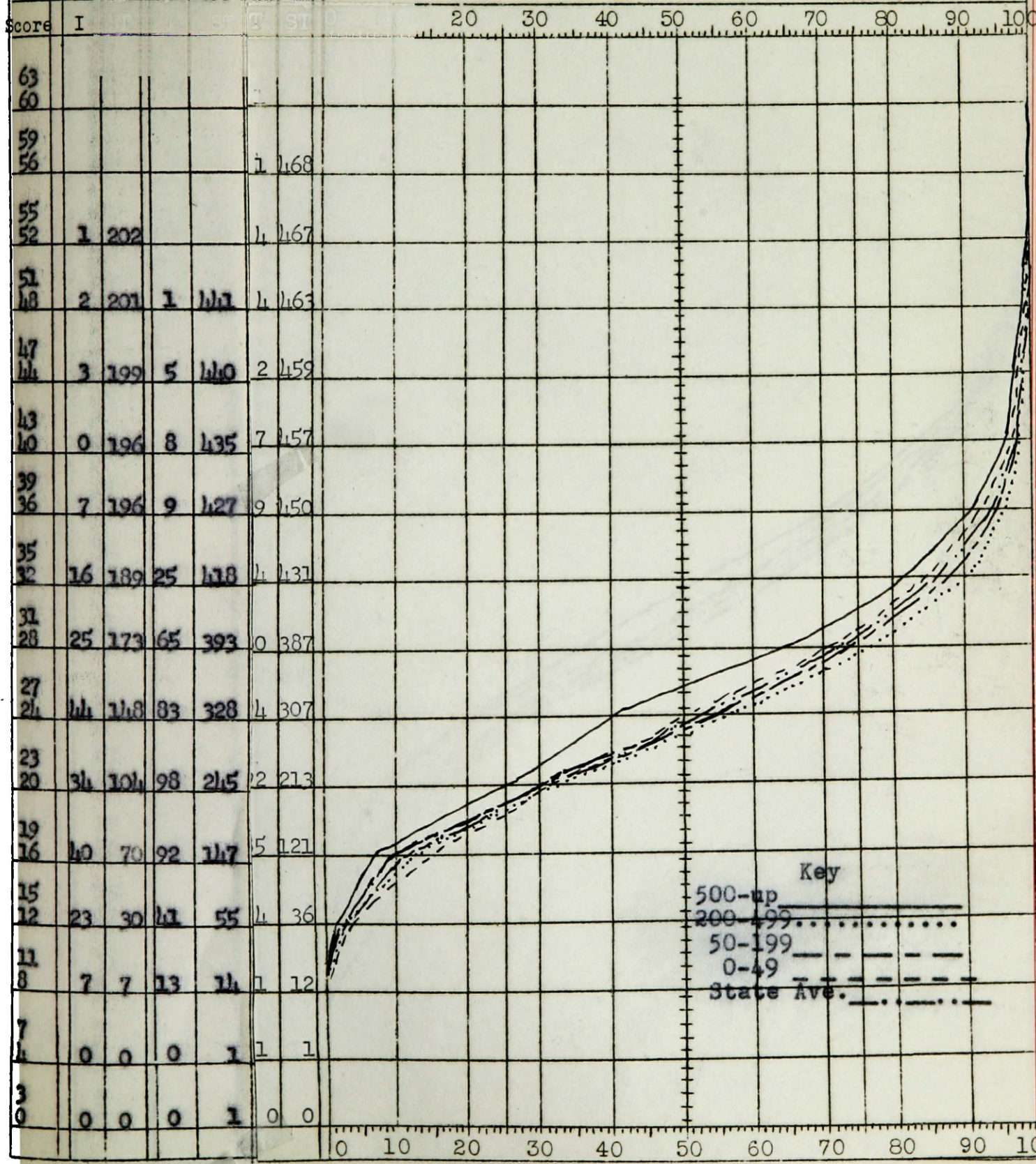




PERCENTILE GRAPH

Number Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph IV



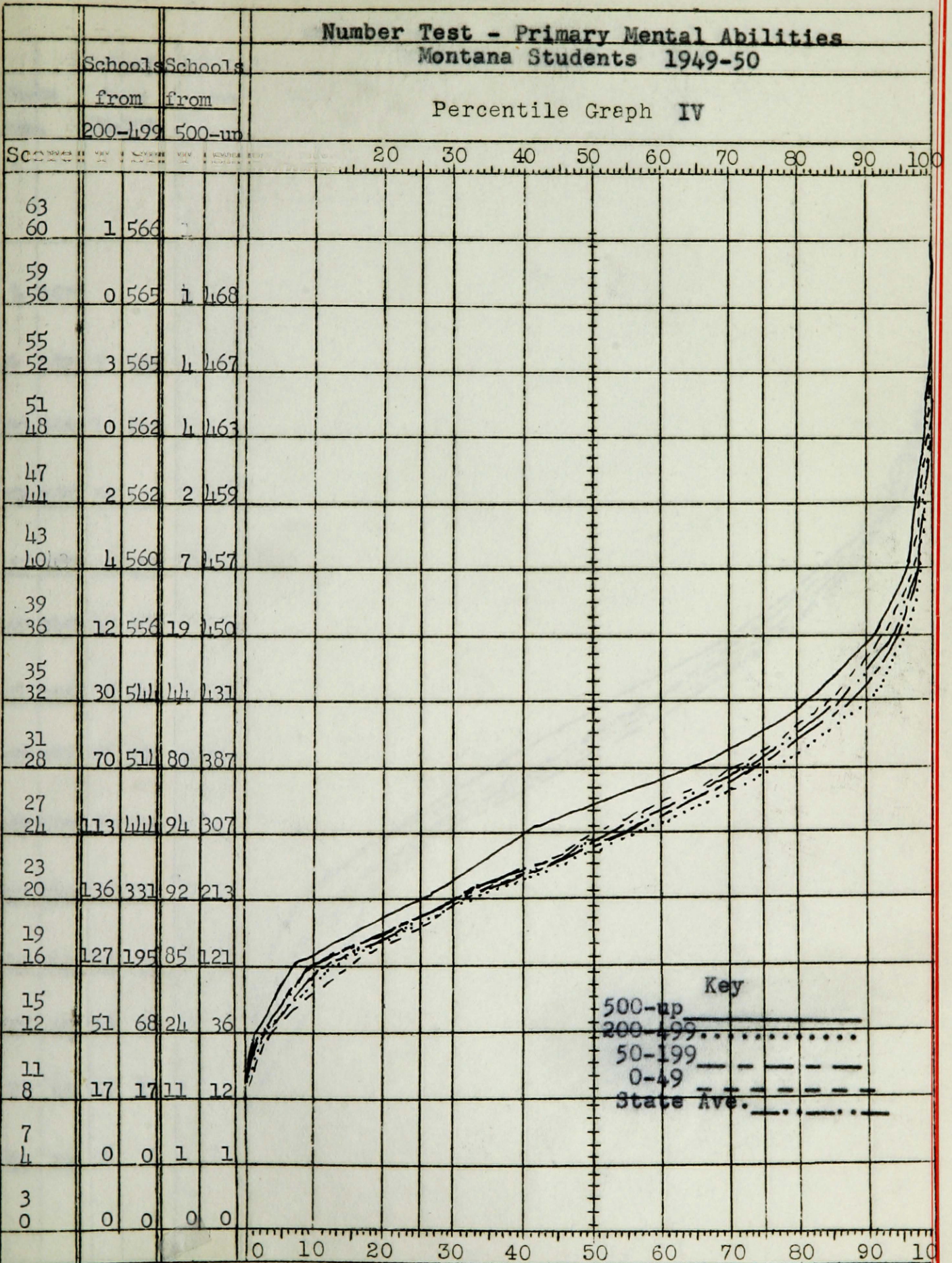
Key  
 500-up —————  
 200-499 .....  
 50-199 - - - - -  
 0-49 - · - · - ·  
 State Ave. —————



PERCENTILE GRAPH

Number Test - Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph IV



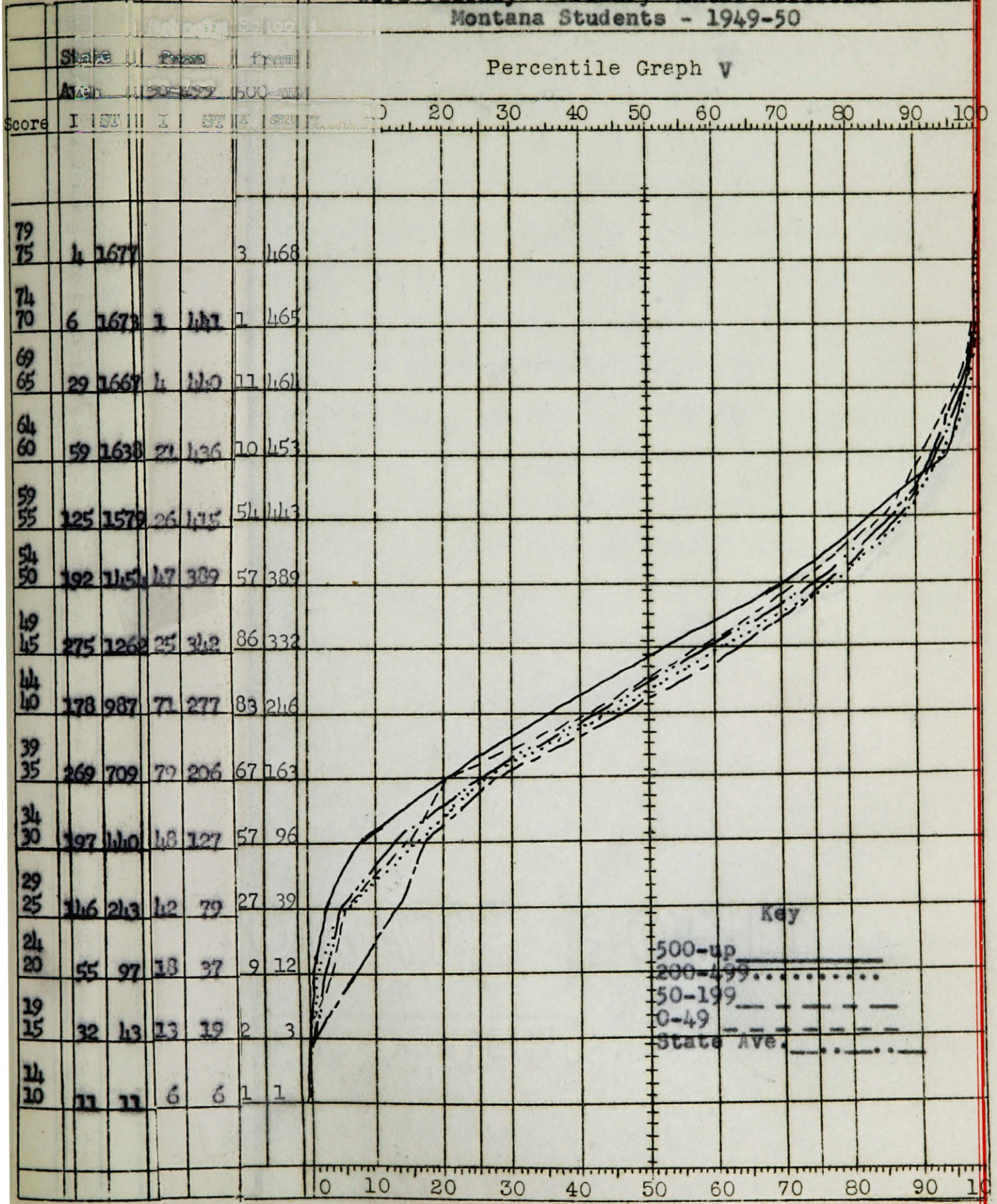
Key  
 500-up —————  
 200-499 .....  
 50-199 - - - - -  
 0-49 - · - · - ·  
 State Ave. ————



PERCENTILE GRAPH

Word Fluency - Primary Mental Abilities  
Montana Students - 1949-50

Percentile Graph V

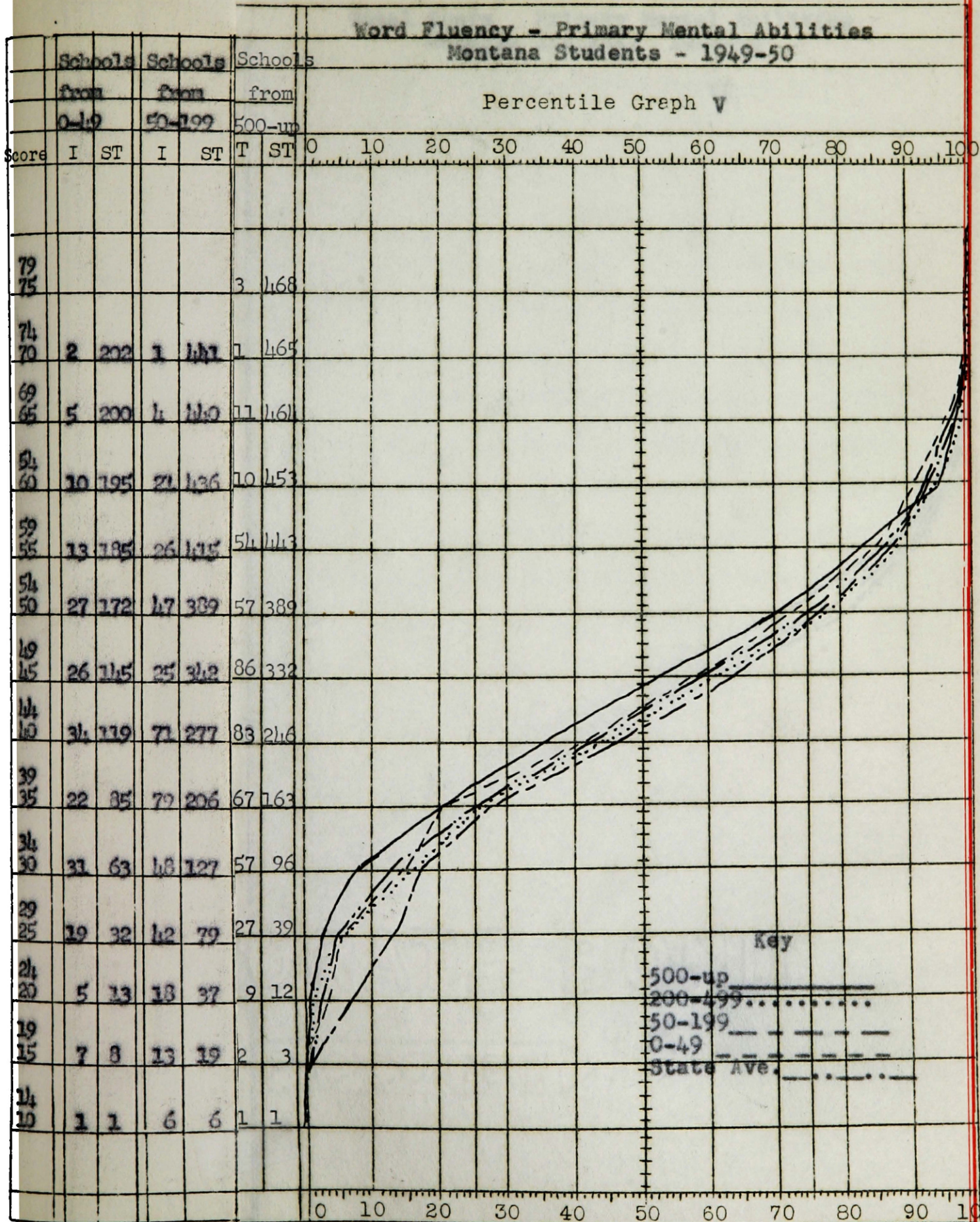


Key  
 500-up \_\_\_\_\_  
 200-499 .....  
 50-199 - - - - -  
 0-49 - · - · - ·  
 State Ave. \_\_\_\_\_



PERCENTILE GRAPH

Word Fluency - Primary Mental Abilities  
Montana Students - 1949-50

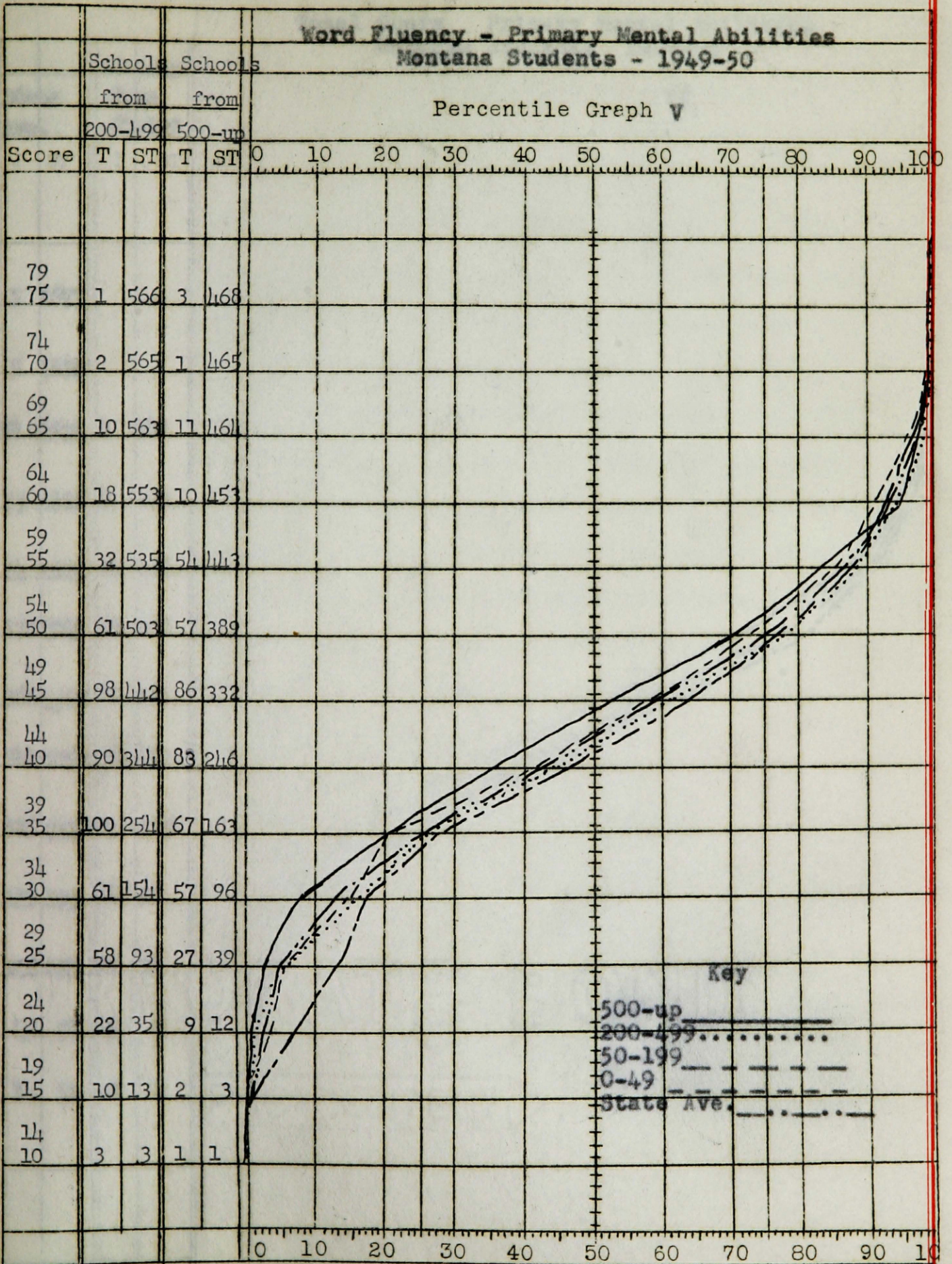




PERCENTILE GRAPH

Word Fluency - Primary Mental Abilities  
Montana Students - 1949-50

Percentile Graph V



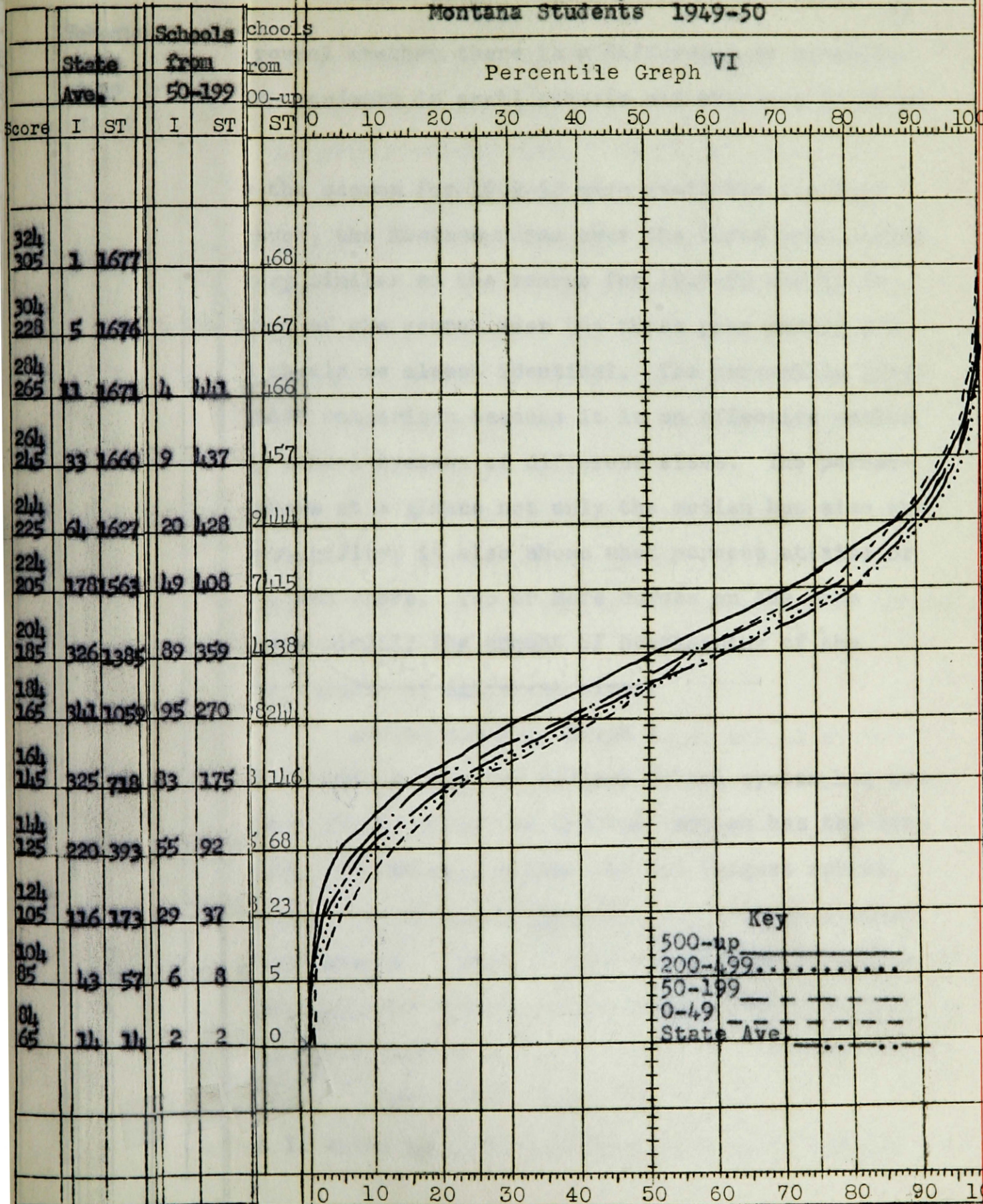


PERCENTILE GRAPH

Total Score Primary Mental Abilities  
Montana Students 1949-50

78

Percentile Graph VI



Key  
 500-up \_\_\_\_\_  
 200-499.....  
 50-199 - - - - -  
 0-49 - . - . - .  
 State Ave. - - - - -



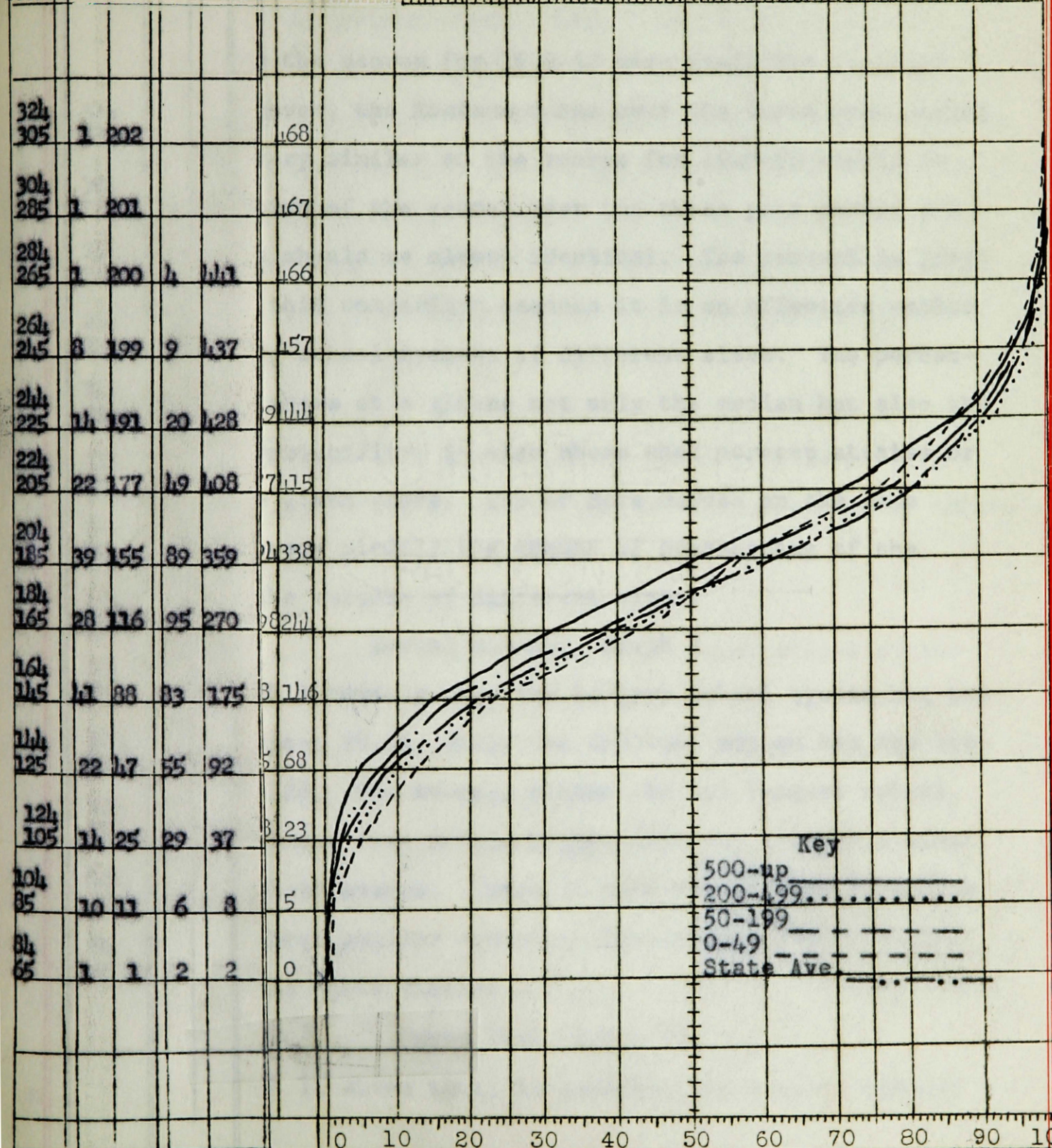
PERCENTILE GRAPH

Total Score Primary Mental Abilities  
Montana Students 1949-50

7

Percentile Graph VI

Score 0 20 30 40 50 60 70 80 90 100



Key  
 500-up \_\_\_\_\_  
 200-199 .....  
 50-199 - - - - -  
 0-49 - - - - -  
 State Ave. \_\_\_\_\_

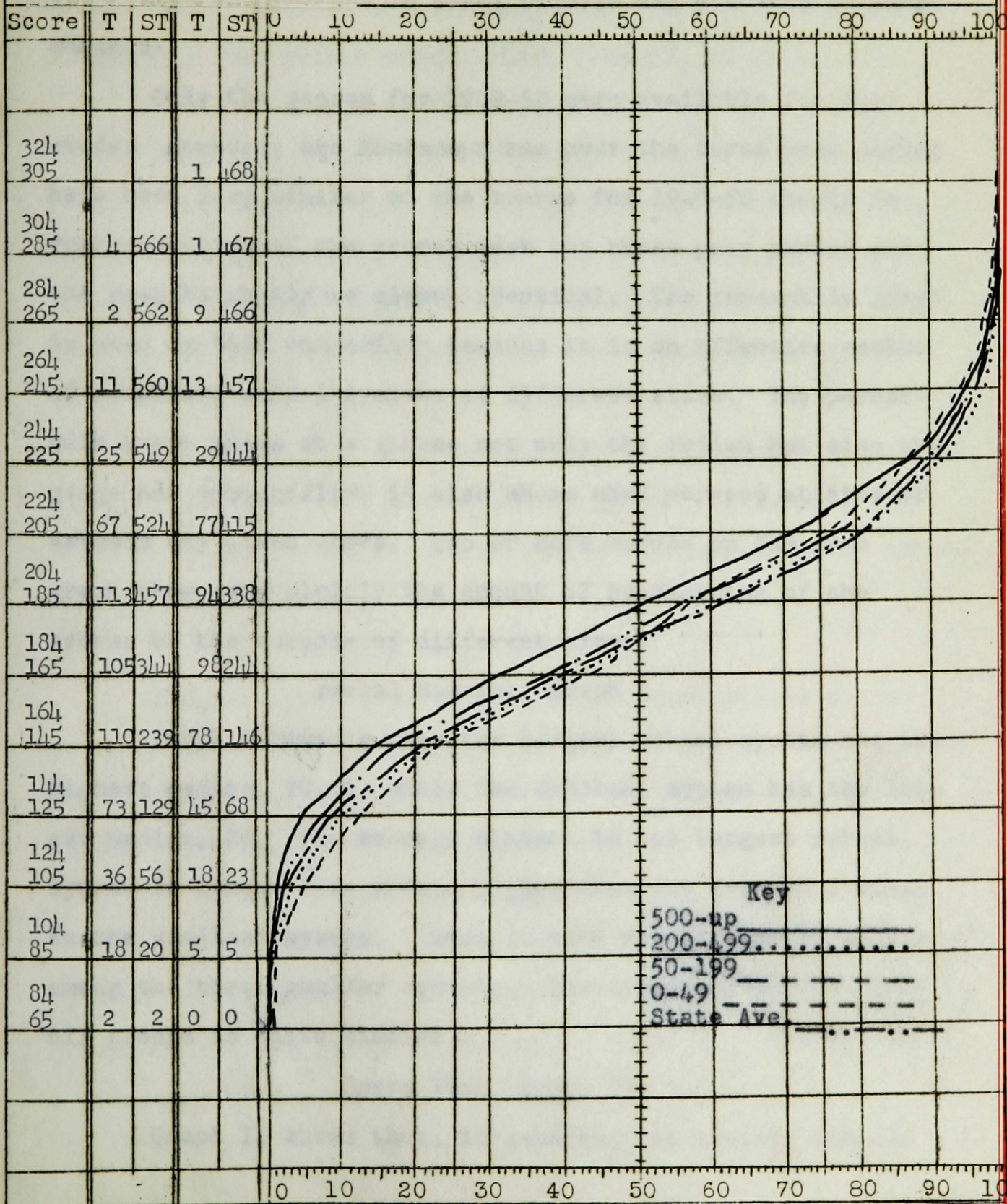
324					
305	1	202			168
304					
285	1	201			167
284					
265	1	200	4	111	166
264					
245	8	199	9	137	157
244					
225	14	191	20	128	141
224					
205	22	177	49	108	115
204					
185	39	155	89	359	1338
184					
165	28	116	95	270	821
164					
145	41	88	83	175	3116
144					
125	22	47	55	92	568
124					
105	14	25	29	37	823
104					
85	10	11	6	8	5
84					
65	1	1	2	2	0



PERCENTILE GRAPH

Local Score Primary Mental Abilities  
Montana Students 1949-50

Percentile Graph VI



Key  
 500-up \_\_\_\_\_  
 200-499 .....  
 50-199 - - - - -  
 0-49 - . - . - .  
 State Ave. - - - - -



PERCENTILE GRAPH

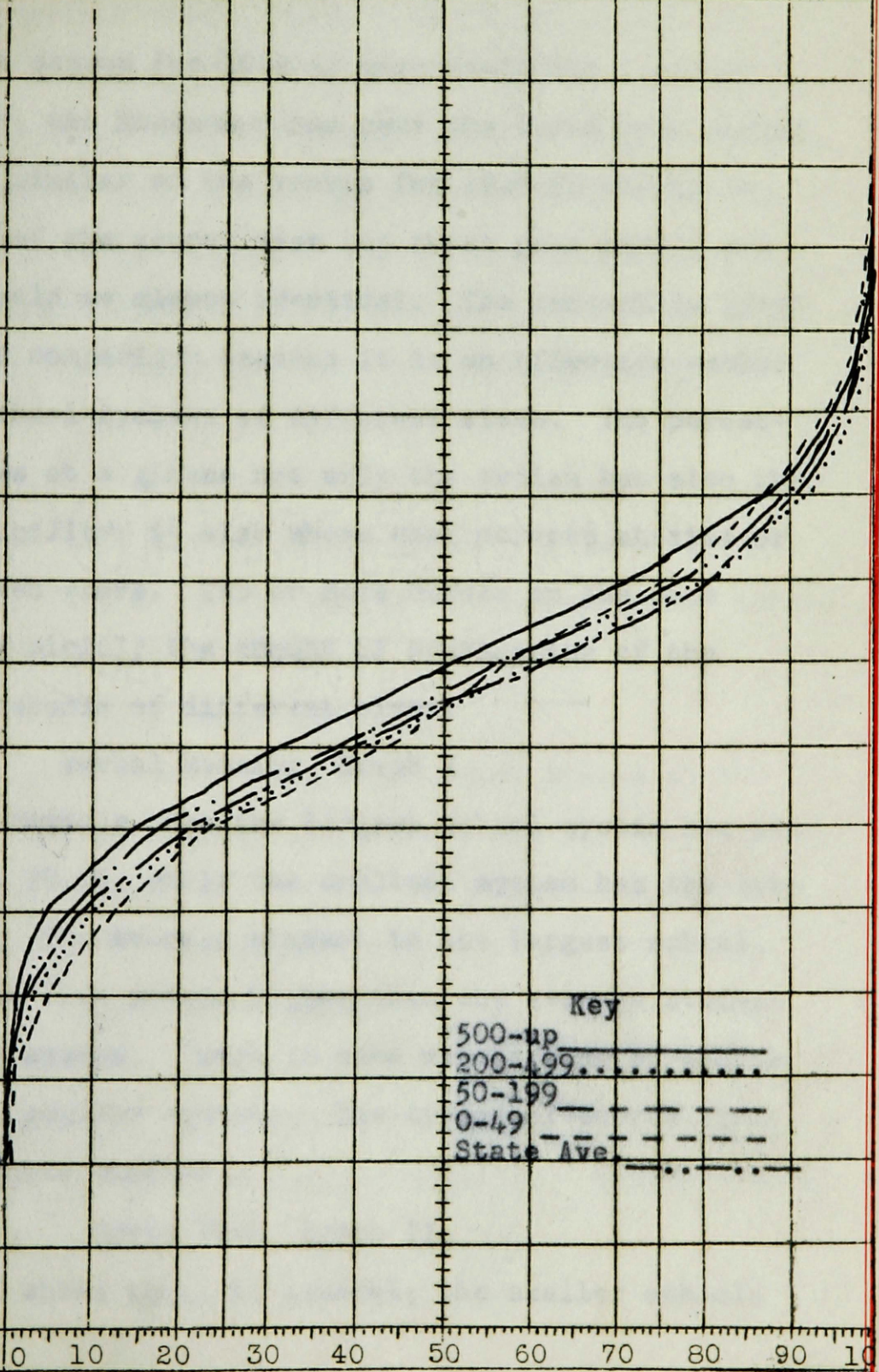
Total Score Primary Mental Abilities  
Montana Students 1949-50

7

Percentile Graph VI

Score: 20 30 40 50 60 70 80 90 100

324			
305		1	68
304			
285	4	566	1 67
284			
265	2	562	9 66
264			
245	11	560	13 65
244			
225	25	549	29 64
224			
205	67	524	77 63
204			
185	113	457	94 62
184			
165	105	444	98 61
164			
145	110	239	78 60
144			
125	73	129	45 59
124			
105	36	56	18 58
104			
85	18	20	5 57
84			
65	2	2	0 56



Key  
 500-up \_\_\_\_\_  
 200-499 .....  
 50-199 - - - - -  
 0-49 - . - . - .  
 State Ave. - - - - -

study will reveal whether there is a difference in intelligence between students in small schools and students in large schools.

Only the scores for 1949-50 were available for this study. However, the Montana norms over the three year period have been very similar so the scores for 1949-50 should be representative of the scores over the three year period and the results should be almost identical. The percentile graph is used in this comparison because it is an effective method of comparing school systems of different sizes. The percentile graph shows at a glance not only the median but also the range and variability; it also shows what percent attains or exceeds any given score. Two or more curves on the same graph show very plainly the amount of overlapping of the scores of the schools of different sizes.

#### Verbal Meaning Graph I

Graph I reveals that the largest school system has the highest median, 30.75, while the smallest system has the lowest median, 26. The average student in the largest school system is almost five points higher than the average student in the smallest system. There is some overlapping of scores among the three smaller systems. The spread of scores for all groups is quite similar.

#### Space Test Graph II

Graph II shows that, in general, the smaller schools



ranked higher than the larger schools. The median scores are quite closely grouped together and there is much overlapping of scores. The median scores range from 23. to 25.5.

#### Reasoning Test Graph III

Graph III shows that the median scores are very closely grouped together and that they range from 15.5 to 16.5. The largest schools have the highest score at the median, but at the seventy-fifth percentile the smallest schools are highest. There is a considerable amount of overlapping of scores.

#### Number Test Graph IV

Graph IV shows that the largest school system is consistently higher. The median scores range from 22.5 to 25.5. There is a great deal of overlapping of scores among the three smaller groups of school systems.

#### Word Fluency Graph V

Graph V again reveals that the largest school system is consistently higher and has the highest median. The median scores range from 41. to 43.5. There is some overlapping of scores, particularly in the higher percentiles.

#### Total Score Graph VI

Graph VI reveals that the largest schools have the highest median score and that the median score for the three groups of smaller schools are grouped together. There is some overlapping of scores for the smaller systems.

Conclusions. These graphs seem to indicate that the average student in school systems of over 500 students are slightly more intelligent than the average student in school systems under 500 students. However, this may be largely due to better teachers, better methods of instruction, more equipment, and better school systems in general. This in turn would indicate that the scores of the Verbal Meaning test, the Number test, and the Word Fluency test are more greatly influenced by academic training than are the Reasoning test and the Space test.

## CHAPTER VII

### A REVIEW OF THE IOWA TESTS OF EDUCATIONAL DEVELOPMENT USED IN THE MONTANA STATE WIDE COOPERATIVE TESTING PROGRAM

This chapter will be concerned with a review of the Iowa Tests of Educational Development used in the Montana State Wide Cooperative Testing Program for 1948-49 and 1949-50. Emphasis will be placed on the 1949-50 results in which the distribution of scores for the Composite test, the average score for the first eight tests, for schools of different sizes will be shown and discussed.

Tables XVI, XVII, and XVIII summarize the number of tests administered and the number of schools and pupils participating in the tenth and twelfth grades for 1948-49 and 1949-50. These tables reveal that the number of schools participating has increased by eleven and the number of students participating has increased by six hundred and thirty five over the previous year. The greatest increase took place among the smaller school systems (50-199).

The number of schools administering the IED tests is most encouraging and is one of the bright spots in the state wide testing program since a greater percentage of schools and pupils participate in this part of the program than in any other portion of the program.

TABLE XVI  
SCHOOLS GIVING THE IED TESTS IN 1948-49<sup>1</sup>

Size of School	School Systems	Schools Part.	Percent of Schools Part.
500-up	7	2	29
200-499	19	9	47
50-199	85	31	36
0-49	69	31	45
Total	180	73	41

TABLE XVII  
SCHOOLS GIVING THE IED TESTS IN 1949-50<sup>2</sup>

Size of School	School Systems	Schools Part.	Percent of Schools Part.
500-up	7	1	14
200-499	23	12	57
50-199	81	38	45
0-49	69	33	48
Total	180	84	46

TABLE XVIII  
NUMBER OF IED TESTS GIVEN IN 1948-49 AND 1949-50<sup>3</sup>

	1948-49	1949-50
Grade 10	1831	2292
Grade 12	1839	2063
Total	3720	4355

<sup>1</sup>Cheney, Second Annual Report, op. cit., p. 3.

<sup>2</sup>Cheney, Third Annual Report, op. cit., p. 3.

<sup>3</sup>Data obtained from the Second and Third Annual Reports.

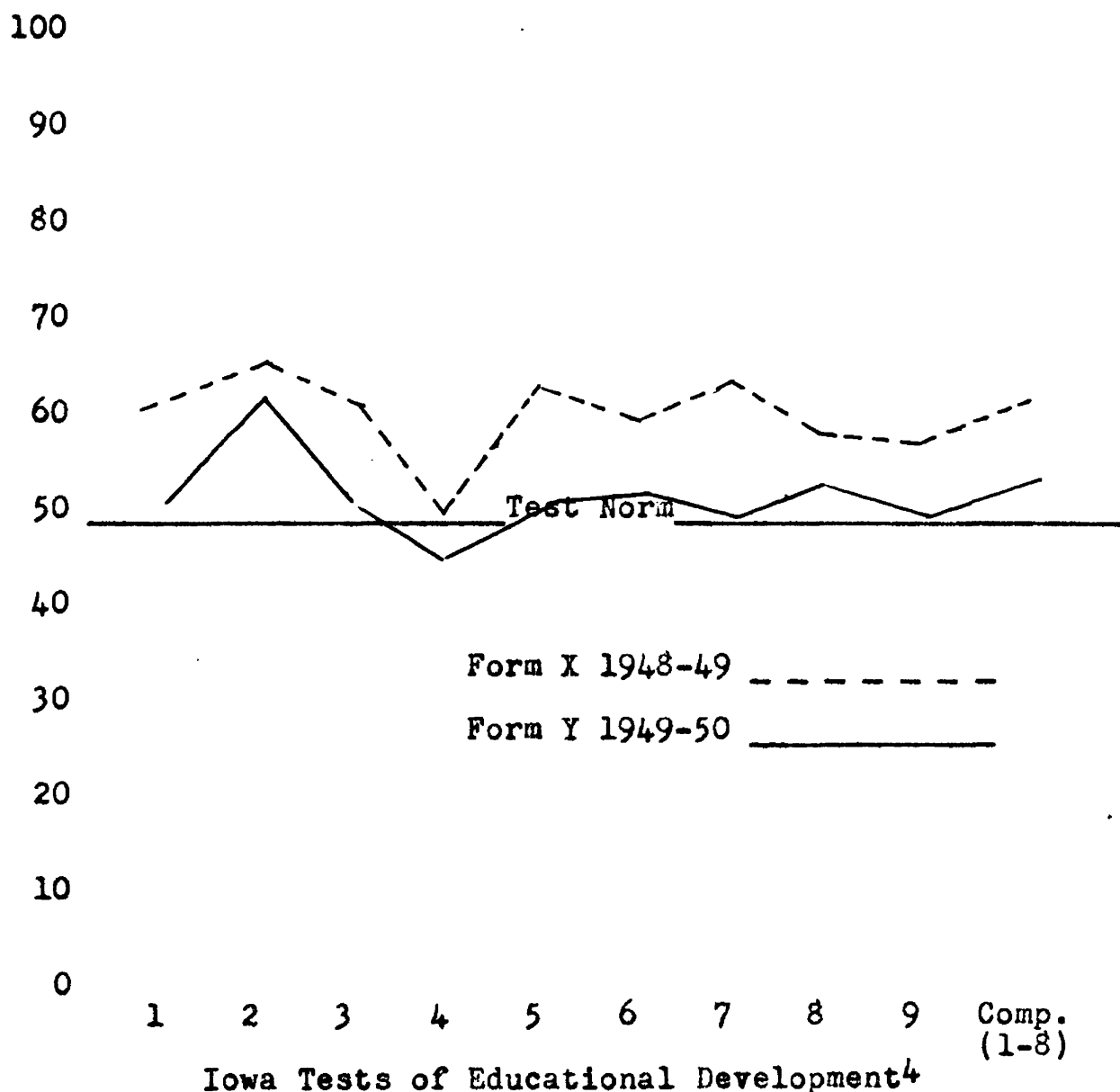


FIGURE 2

THE MEAN PERFORMANCE OF AN AVERAGE MONTANA  
TENTH GRADE STUDENT ON THE IED TESTS<sup>5</sup>

<sup>4</sup>The IED Tests are composed of (1) Basic Social Concepts, (2) Background in Nat. Sciences, (3) Correctness in Writing, (4) Ability to do Quantitative Thinking, (5) Interpretation in the Soc. Sciences, (6) Interpretation in the Nat. Sciences, (7) Interpretation of Literary Material, (8) Vocabulary, (9) Use of Sources of Information.

<sup>5</sup>Cheney, Third Annual Report, op. cit., p. 10.

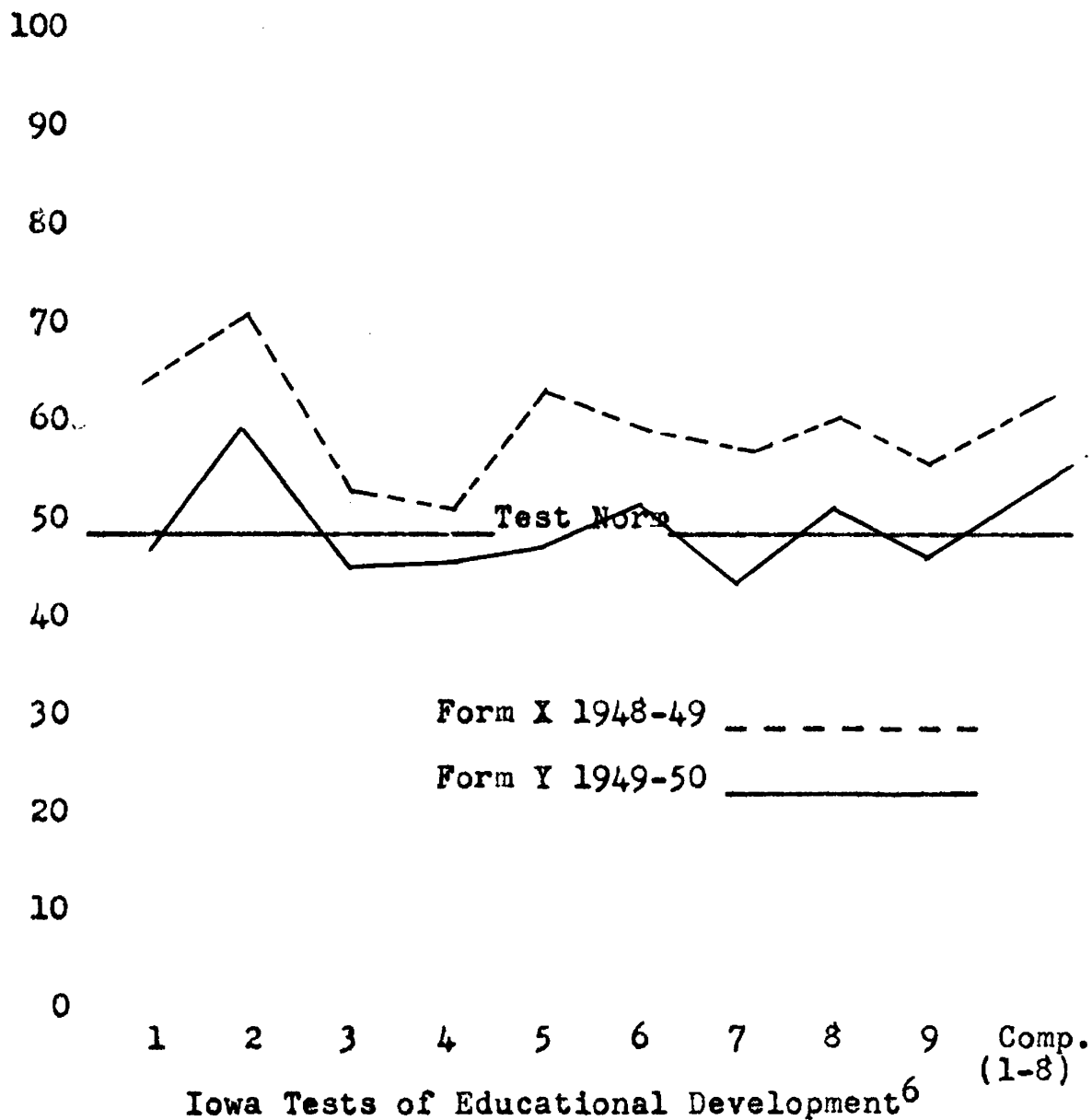


FIGURE 3

THE MEAN PERFORMANCE OF AN AVERAGE MONTANA  
TWELFTH GRADE STUDENT ON THE IED TESTS<sup>7</sup>

<sup>6</sup>The IED Tests are composed of (1) Basic Social Concepts, (2) Background in Nat. Science, (3) Correctness in Writing, (4) Ability to do Quantitative Thinking, (5) Interpretation in the Social Sciences, (6) Interpretation in the Nat. Sciences, (7) Interpretation of Literary Material, (8) Vocabulary, (9) Use of Sources of Information.

<sup>7</sup>Cheney, Third Annual Report, op. cit., p. 10.



TABLE XIX

MEAN SCORES FOR THE AVERAGE MONTANA STUDENT ON THE  
IOWA TESTS OF EDUCATIONAL DEVELOPMENT<sup>8</sup>

Test	Form X 1948-49		Form Y 1949-50	
	Grade 10	Grade 12	Grade 10	Grade 12
	1	15.7	22.0	14.2
2	16.4	19.2	15.4	17.0
3	16.1	18.8	14.6	17.5
4	14.5	17.0	13.7	15.8
5	16.3	20.1	14.2	17.7
6	15.8	19.5	14.6	17.5
7	16.5	19.3	14.2	16.8
8	16.1	19.9	15.5	17.7
9	15.7	18.8	14.3	17.9
Comp.	16.1	20.1	15.5	18.6

The Performance of the average Montana Student. By looking at Figures 2 and 3, it can be seen that the norms for Montana Students were lower in 1949-50 than they were in 1948-49. This discrepancy may be partly due to the fact that different forms of the IED Tests were used and it may be partly due to the fact that the 1948-49 norms were made by Science Research Associates and that the 1949-50 norms were made under the supervision of Mr. Cheney.<sup>9</sup> Cheney believes that the 1949-50 norms are more reasonable since they are closer to the national norms. Table XIX also reveals that

<sup>8</sup>Data obtained from the 2nd and 3rd Annual Reports.

<sup>9</sup>Mr. Cheney is the Supervisor of Occupational Information and Guidance of the Montana State Department of Public Instruction.

the mean in all instances is lower in 1949-50 by almost two points than it was in 1948-49.

According to Figures 2 and 3, the average Montana student ranks highest in Test 2 (Background in Natural Science) and in Test 8 (Vocabulary). He ranks low in Test 4 (Quantitative Thinking) and in Test 7 (Ability to Interpret Literary Material). On the other tests he is fairly close to the national average. These figures also reveal that the average Montana tenth grade student is below the national average on only one test, while the average twelfth grade student is below the national average on six tests. Table XIX shows that the average Montana student has a higher mean score in the twelfth grade than he does in the tenth grade. However, by looking at Figures 2 and 3, it can be seen that the difference in the mean scores between the tenth and the twelfth grade is not as great as it should be, because the average twelfth grader dropped in percentile rank in every test except Test 4 (Quantitative Thinking) where he remained at the forty-eighth percentile. Whereas if he had developed and improved like he should have, he would have the same percentile rank in both grades. However, it must be remembered that different pupils are involved in both instances.

From this discussion a number of interesting conclusions can be drawn.

1. The average Montana student receives superior

training in the Natural Sciences compared to the students on whom the tests were standardized.

2. He receives more training in Vocabulary study and in the use and meaning of words than the student on whom the tests were standardized.

3. The average Montana student does not get the training he should in Quantitative Thinking or in general problem solving ability as the student on whom the tests were standardized receives.

4. He does not receive adequate training in the Ability to Interpret Literary Materials or in reading and studying world literature as does the student on whom the tests were standardized.

5. These tests indicate that the training that the average Montana student receives in the last two or three years of school is not as good as his earlier training.

The distribution of scores on the IED tests for schools of different sizes. Since no information is available as to how school systems of different sizes compare to each other on standardized achievement tests, it was thought that such a study would be of value. This study will reveal whether there is a difference in achievement of a typical student in school systems of different sizes. If there is a difference in achievement as measured by a standardized test, this study

may indicate to some degree which size school systems do the best job of teaching and training students.

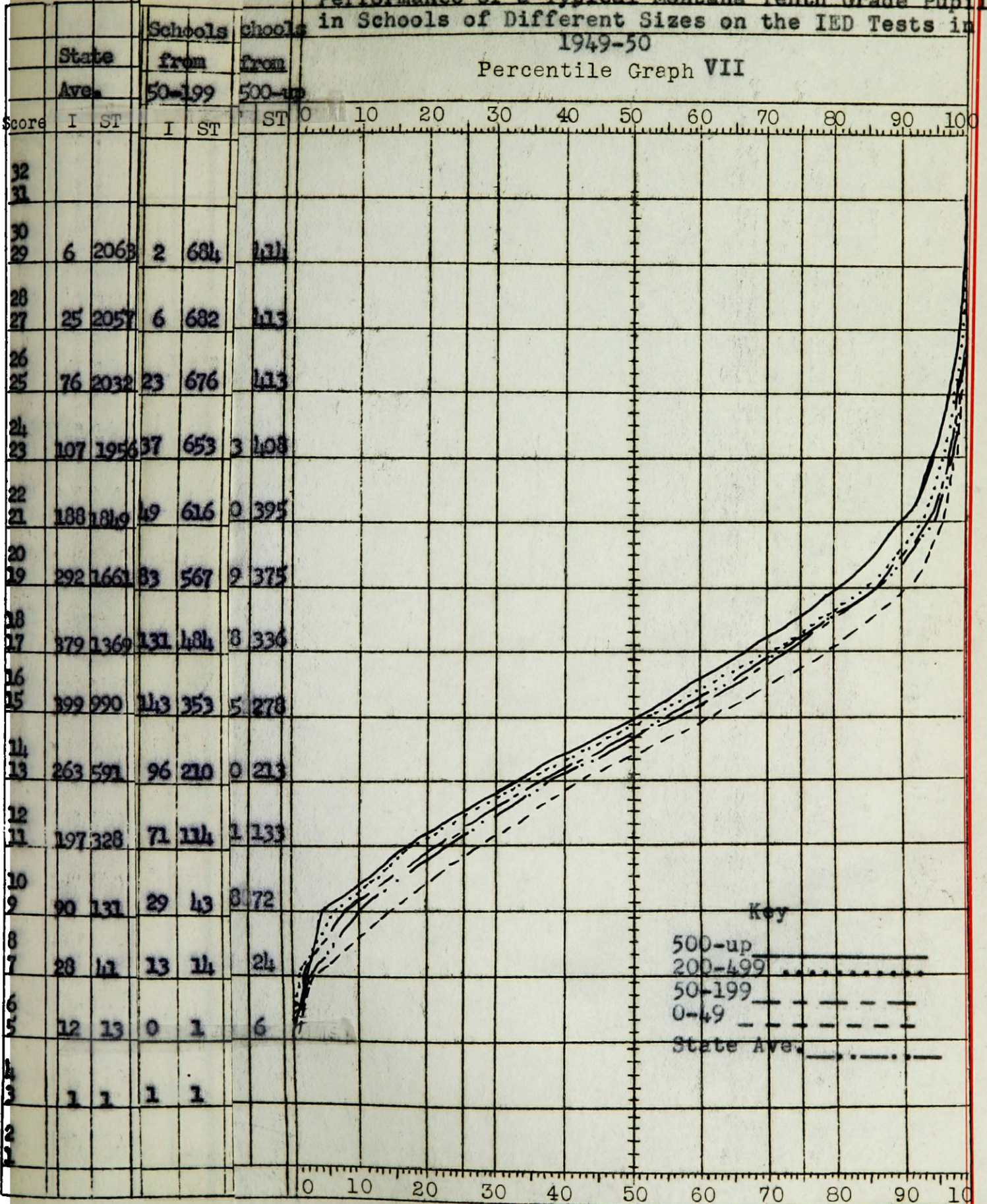
In this study only the Composite score, the average score for the first eight tests, was used because the Composite score gives a single representative picture of achievement of pupils in eight high school areas. In addition, it was felt that because of the high intercorrelations of these tests, the results in most instances would be very similar. The percentile graph is used in this study because it is an effective means of comparing school systems of different sizes.

By looking at graphs VII and VIII, one can see that in both the tenth and the twelfth grades the students in the largest school systems scored consistently higher in every percentile than students in the school systems of smaller sizes. The students in the smallest school system scored lowest in nearly every percentile. In the tenth grade, the median score in school systems of different sizes is 14.0 for school systems from 0-49, 14.6 for school systems from 50-199, 14.8 for school systems from 200-499, and 14.9 for school systems of five hundred students and over. In the twelfth grade the median score in school systems of different sizes is 16.2 for school systems from 0-49, 16.9 for school systems from 50-199, 17.2 for school systems from 200-499, and 19.1 for school systems of five hundred students



PERCENTILE GRAPH

Performance of a Typical Montana Tenth Grade Pupil  
in Schools of Different Sizes on the IED Tests in  
1949-50  
Percentile Graph VII



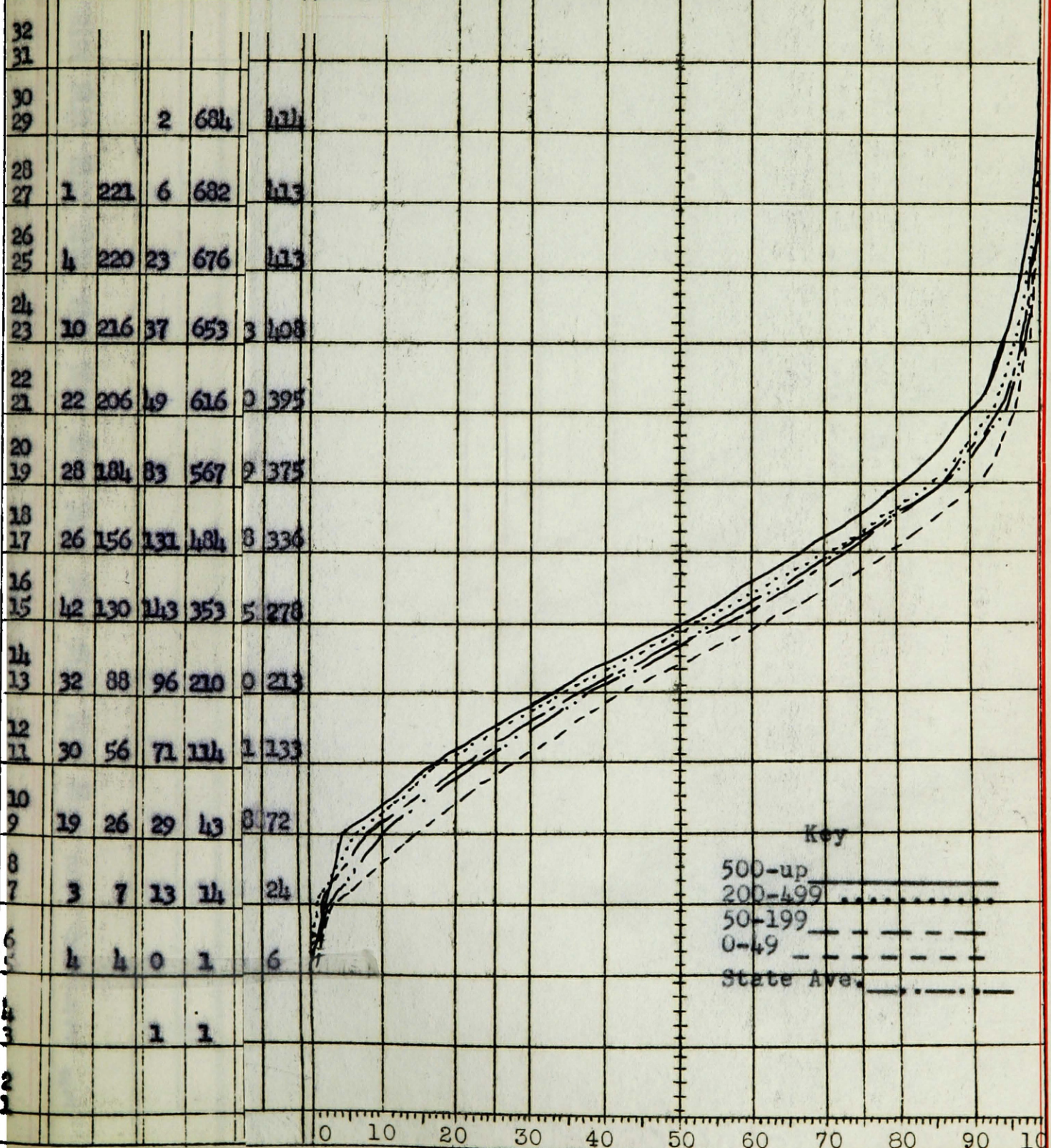
Key  
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 200-499 .....  
 50-199 - - - - -  
 0-49 - - - - -  
 State Ave. - - - - -



PERCENTILE GRAPH

Performance of a Typical Montana Tenth Grade Pupil  
 in Schools of Different Sizes on the IED Tests in  
 1949-50  
 Percentile Graph VII

Score



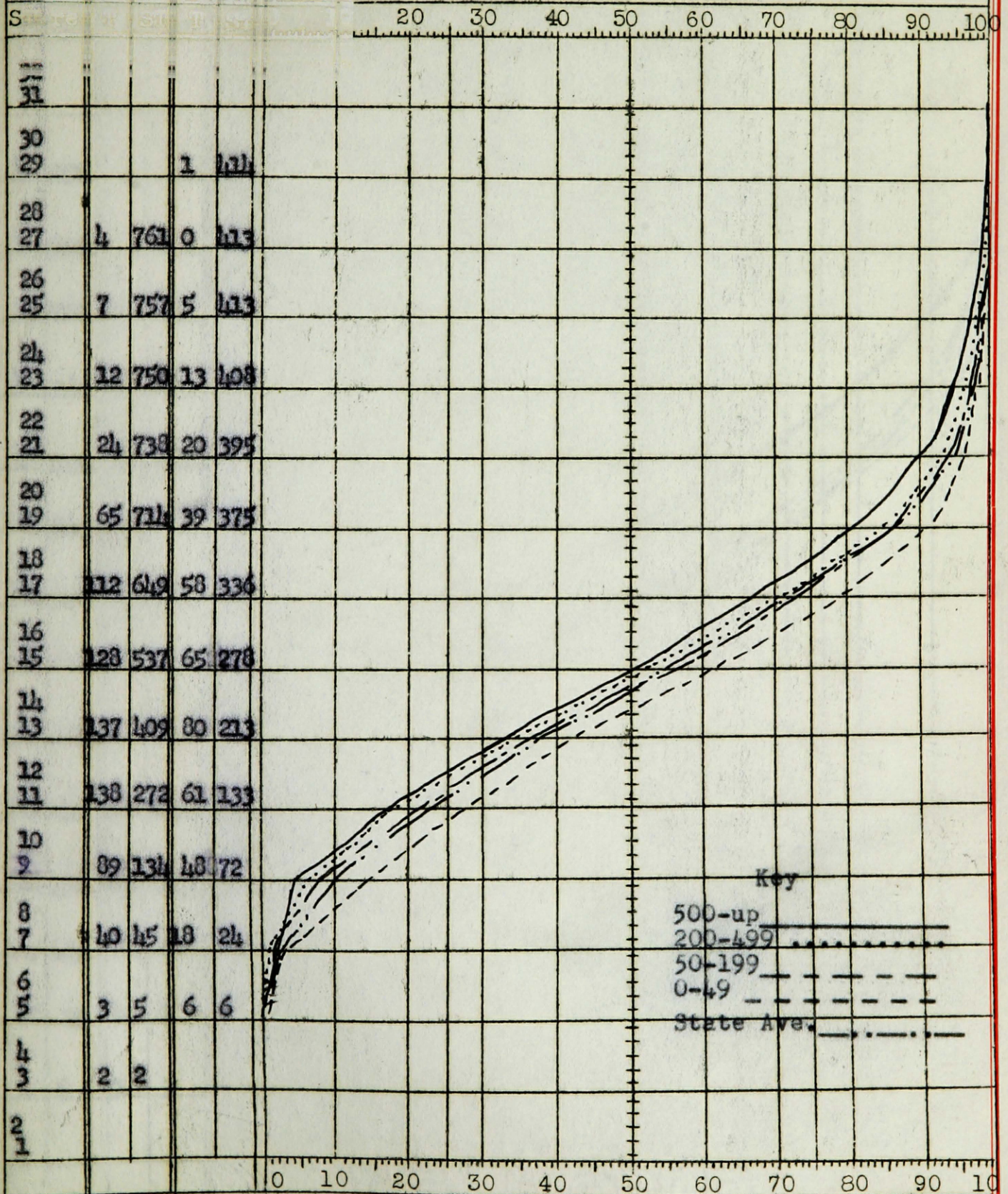
Key  
 500-up —————  
 200-499 .....  
 50-199 - - - - -  
 0-49 - . - . - .  
 State Ave. — . . . . .

Score	Schools	Schools	Schools	Schools	Schools
32					
31					
30					
29		2	684		411
28					
27	1	221	6	682	413
26					
25	4	220	23	676	413
24					
23	10	216	37	653	3 408
22					
21	22	206	49	616	0 395
20					
19	28	184	83	567	9 375
18					
17	26	156	131	484	8 336
16					
15	42	130	143	353	5 278
14					
13	32	88	96	210	0 213
12					
11	30	56	71	114	1 133
10					
9	19	26	29	43	8 72
8					
7	3	7	13	14	24
6					
5	4	4	0	1	6
4					
3			1	1	
2					
1					



PERCENTILE GRAPH

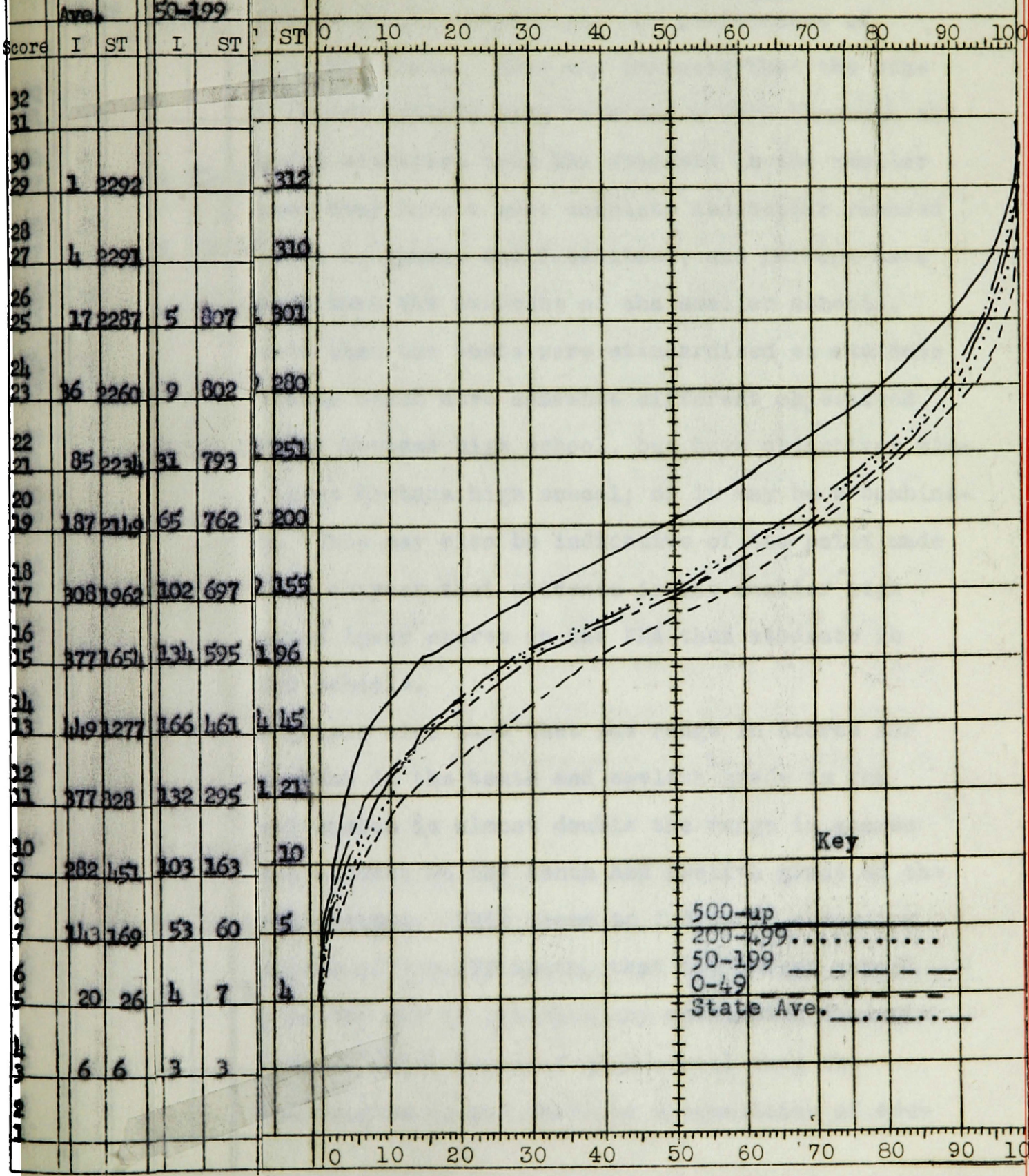
Performance of a Typical Montana Tenth Grade Pupil  
in Schools of Different Sizes on the IED Tests in  
1949-50  
Percentile Graph VII





PERCENTILE GRAPH

Performance of a Typical Twelfth Grade Pupil in  
Schools of Different Sizes on the IED Tests in  
1949-50  
Percentile Graph VIII



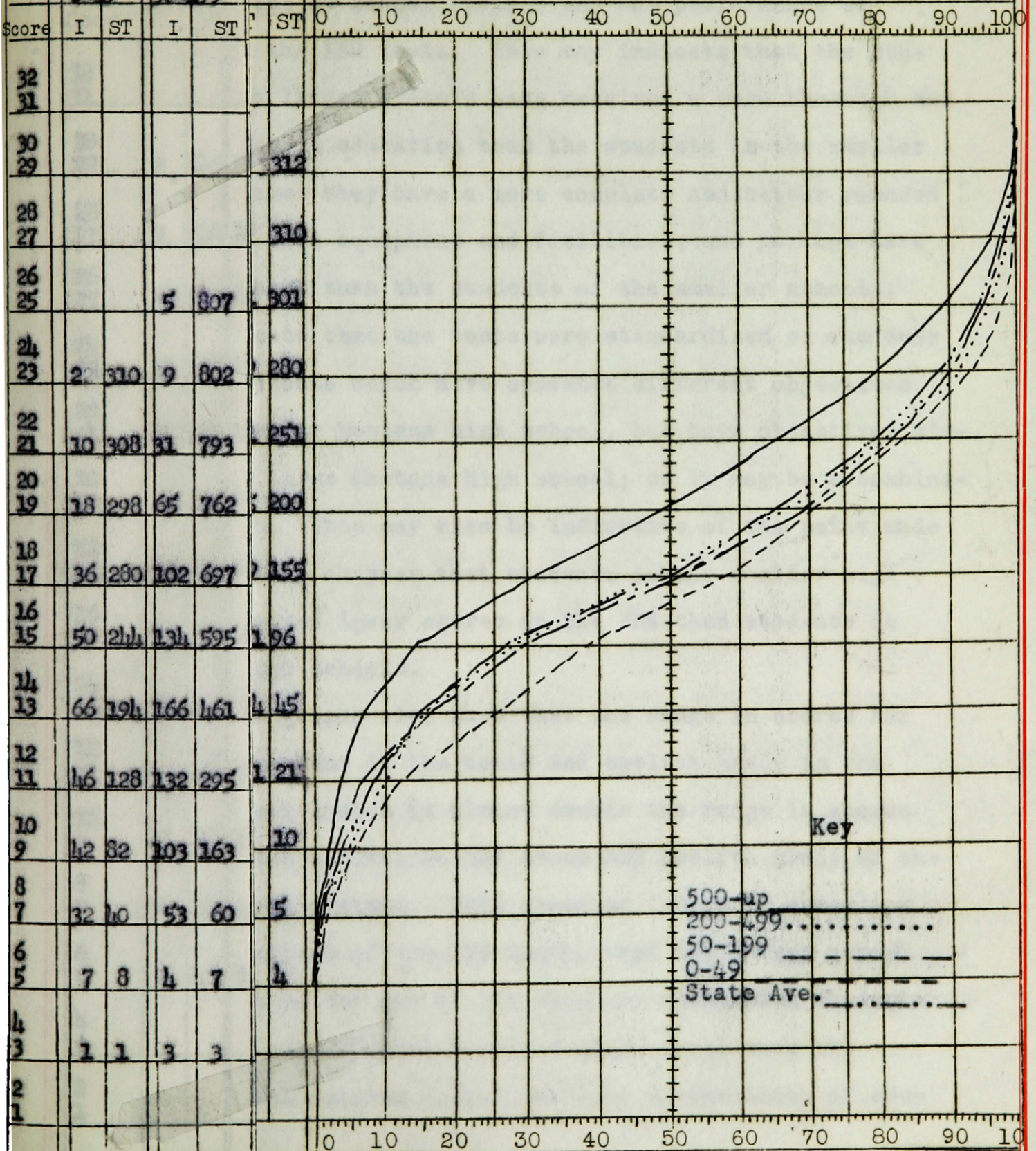
Key

- 500-up —————
- 200-499.....
- 50-199 - - - - -
- 0-49 - - - - -
- State Ave. ....



PERCENTILE GRAPH

Performance of a Typical Twelfth Grade Pupil in Schools of Different Sizes on the IED Tests in 1949-50  
Percentile Graph VIII



Key

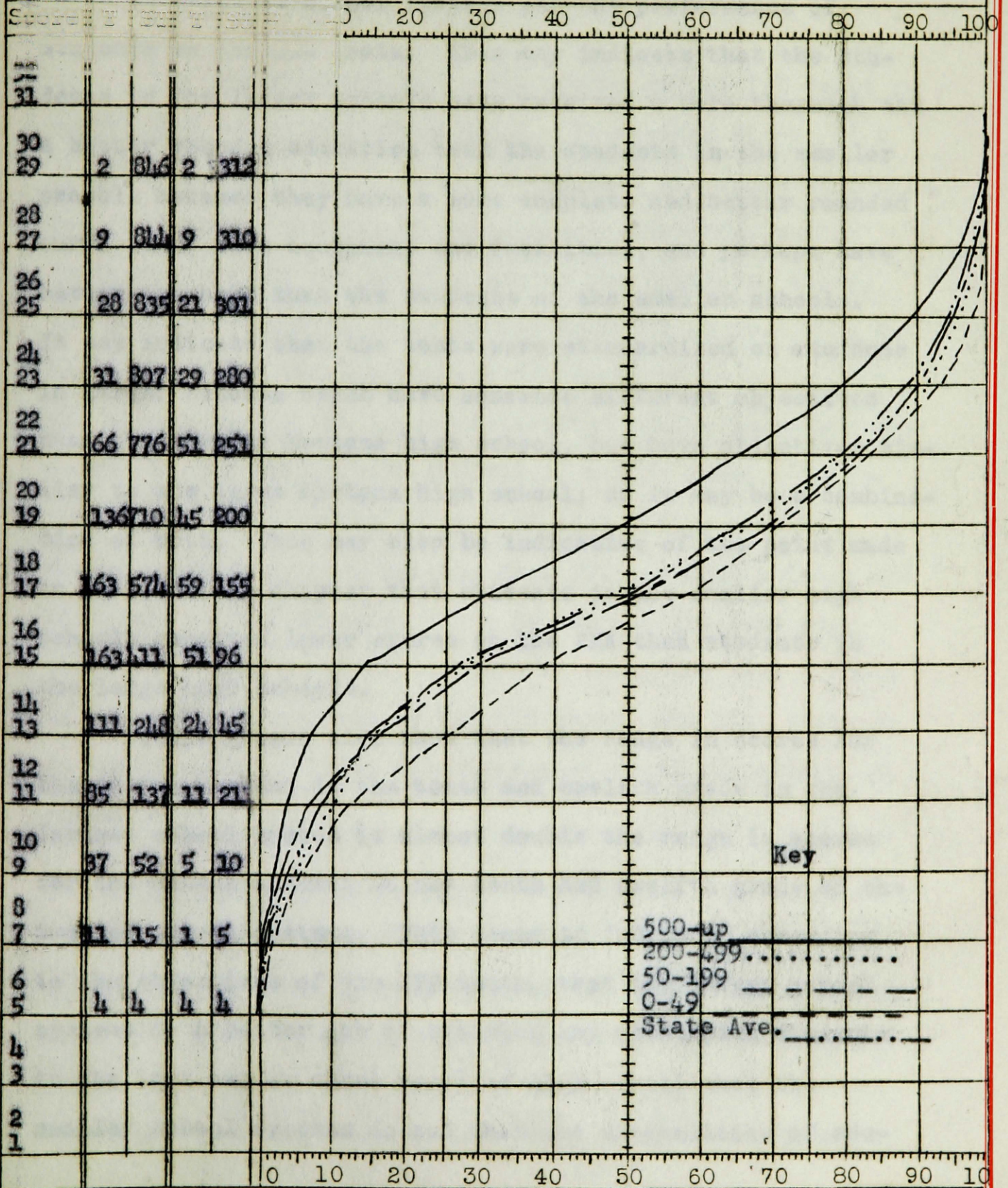
- 500-up —————
- 200-499.....
- 50-199 - - - - -
- 0-49 - - - - -
- State Ave. ....



PERCENTILE GRAPH

Performance of a Typical Twelfth Grade Pupil in  
Schools of Different Sizes on the IED Tests in  
1949-50

Percentile Graph VIII





and over. There appears to be a consistent relationship between the size of school systems and the performance of students on the IED tests. This may indicate that the students in the larger schools have received a more thorough and a better rounded education than the students in the smaller schools because they have a more complete and better rounded curriculum, more equipment and facilities, and perhaps have better teachers than the students of the smaller schools. It may indicate that the tests were standardized on students in larger schools which have somewhat different objectives than the smaller Montana high school, but have objectives similar to the large Montana high school; or it may be a combination of both. This may also be indicative of the point made in the previous chapter that students in the smaller high schools received lower scores on the PMA than students in the large high schools.

These graphs also show that the range in scores for the median student in the tenth and twelfth grade in the largest school system is almost double the range in scores for the median student in the tenth and twelfth grade of the smaller school systems. This seems to indicate, according to the objectives of the IED tests, that the larger school systems do a better job of training and developing students in the last two or three years of high school than the smaller school systems do and that the inequalities of edu-

cation between the large and the small school systems become more pronounced as the students progress.

The distribution of median scores on the IED tests in school systems of different sizes. In another study, of a somewhat similar nature it was found that the range of scores for the average student of various school systems varies tremendously. In the tenth grade on the Composite score, the average student's score varied from 9.2 to 16.4 with a 7.2 point range between the average tenth grade student in the school having the lowest individual median score and the school having the highest individual median score. In the twelfth grade there was a range of 10.1 points with the median student's score ranging from 10.5 to 20.6 between the different school systems. This points out the fact that there is a wide range of differences among the high schools of Montana, as measured by the IED tests, and that students in Montana high schools do not receive equal educational opportunities.

Summary and conclusions. These studies reveal that the average Montana student is above the national average, on the IED tests in Natural Science and Vocabulary training and below the national average in Quantitative Thinking and in Ability to Interpret Literary Materials. These studies also show that the standing of the average Montana student,

according to the national norms, is lower in the twelfth grade than it is in the tenth grade.

These studies also reveal that there is a considerable difference in achievement, measured by the IED tests, among the various schools throughout the state and that generally in the smaller schools, the average pupil scored lower than he did in the large schools and that this discrepancy tends to become greater as the student progresses through school.

Three conclusions may be drawn from these studies.

1. That the IED tests were standardized on large high schools that have somewhat different objectives than the small Montana high schools. This may partially account for the difference in standing on the national norms between the typical Montana tenth grade student and the typical Montana twelfth grade student. It may also partially account for the discrepancy between the average tenth and twelfth grade student in the small high school and the average tenth and twelfth grade student in the large high school.

2. The results on the IED tests may be indicative of the point made in the previous chapter that the average student in the large high school is more intelligent than the average student in the small high school.

3. Tremendous educational inequalities exist throughout the state and that generally the students in the smaller high schools do not have the educational opportunities and

advantages that the students in the large high schools have. If the educational inequalities are as great as they appear to be, then there is a need for curriculum reorganization among many of the smaller schools.

## CHAPTER VIII

### CONCLUSIONS

A consideration of the value of the SRA Primary Mental Abilities and the Iowa Tests of Educational Development, two of the tests used in the Montana State Wide Cooperative Testing Program, and the value of each as a tool in guidance has been the primary purpose of this thesis. A number of conclusions which should be of interest to Montana educators were drawn as a result of this study.

1. The SRA Primary Mental Abilities which were selected and approved by the State Advisory Committee on Guidance because they are useful and valuable tools in guidance, have not yet proved themselves. These tests are still a promising device for research rather than a practical tool for counselors.

2. The Iowa Tests of Educational Development were selected because they measure the pupil's general educational development and provide an objective basis for curriculum evaluation. These tests do not appear to be as valuable as the authors' claim, since the intercorrelations were found to be quite high and, therefore, they do not measure different areas of scholastic achievement to any extent. The principal value of the IED Tests in guidance is to distinguish the degree to which pupils can read; their value in educational

development is largely limited to measuring the growth of reading ability that takes place.

3. In a study of the correlations between the IED tests and the PMA tests, the IED tests were found to be largely verbal, as was expected; the three reading tests (5, 6 and 7) and the Vocabulary test were largely scholastic aptitude tests. The other IED tests, the four background tests (1, 2, 3 and 4) and the test on Sources of Information, are also reading tests to a great extent, but do measure more than factual knowledge, namely, understanding and comprehension as well.

4. According to the PMA tests, the average Montana student is slightly superior in intelligence to the students on whom the tests were standardized. The average Montana student was above the national average on the Verbal Meaning test, the Reasoning test, the Number test, and the Word Fluency test. He was below the national average in the Space test.

5. The average Montana student in the large high schools did better on the PMA tests than the average Montana student in the small high schools, particularly in the Verbal Meaning test, the Number test, and the Word Fluency test.

6. These studies reveal that the average Montana student is above the national average on the IED tests in Natural Science and Vocabulary training and below the national



average in Quantitative Thinking and in the Ability to Interpret Literary Materials. These studies also reveal that the standing of the average Montana student, according to the national norms, is lower in the twelfth grade than in the tenth grade.

7. The average Montana pupil in the large high school scored higher on the IED tests than the average pupil in the small high schools; this discrepancy tends to become greater as the student progresses through high school.

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